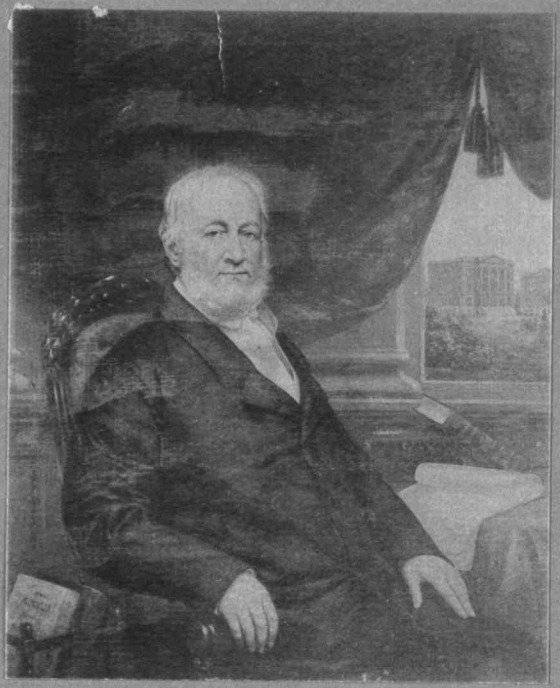

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WILLIAM JOHNSON WALKER, M. D.

The Act of Incorporation of the Massachusetts Institute of Technology, dated April 10, 1861, contained the very important provision that

"within one year after the passage of the Act" (the incorporators) "furnish satisfactory evidence to the Governor and Council that the Institute has funds subscribed, or otherwise guaranteed, for the prosecution of its objects, to an amount of at least one hundred thousand dollars."

Owing to the distractions and excitement of the Civil War, the friends of the Institute had little to show at the expiration of that year, beyond some small subscriptions and a cordial letter from Mr. Ralph Huntington, stating that the Institute would receive $50,000 from him by will. These the State authorities refused to regard as a compliance with the terms of the Act, and it was necessary, therefore, for the projectors to petition for a supplementary Act, which was passed, extending until April 10, 1863, the time during which the financial guarantee might be secured.

Notwithstanding the efforts of those deeply interested in this great project of an Institute of Applied Science, the unsettled condition of the business world, the many demands upon its leaders for money to prosecute the war,

and the temporary diversion of interest and financial aid toward the Boston Society of Natural History, which had actually begun to put up its handsome building, conspired against them, and the spring of 1863 found the Institute with little more to offer to the Governor and Council as an earnest of its good faith than it had been able to present the year before. Therefore, on March 7, 1863, the Finance Committee (consisting of Messrs. M. D. Ross, J. M. Beebe, E. S. Tobey, and N. H. Eldredge), to whom great honor is due for their exertions at this critical time, issued an earnest appeal for contributions. At the end of the month, however, less than $40,000 had been pledged, and it seemed that the weary work of persuading the General Court to further extend the time must be undertaken, and that, with so little to indicate popular interest in the plan, the many forces working against the Institute might this time compass its defeat. With this discouraging outlook, and upon the very last day of the extended year of grace, President Rogers received the following letter:

"Boston, April 10, 1863.

"Dear Sir: — It is with sincere pleasure that we have to inform you that, by an instrument bearing date Newport, second of April, 1863, a gift of property has been made to the 'Massachusetts Institute of Technology,' by Dr. William J. Walker, at present a resident in Newport, R. I., but formerly a citizen of Boston, which is worth not less than sixty thousand dollars, and probably from ten to twelve thousand dollars more.

"We cannot forbear to congratulate the friends of this valuable Institution on this munificent donation, made so opportunely and at a moment peculiarly important in its history, while at the same time we would also gratefully recognize the voluntary manner in which the gift has been bestowed, as well as the truly liberal spirit which marked the personal intercourse between the generous donor and the undersigned, through whom he has been pleased to indicate his benevolent purposes in reference to this Institution.

"We may add, that it is probable that Doctor Walker may at an early day

communicate directly to the Government of the Institute his views as to its future mode of carrying out its objects.

"With great respect, we have the honor to remain,

"Your obedient servants,

"EDWARD S. TOBEY,

"JAMES M. BEEBE."

The instrument referred to read, in part, as follows:

"KNOW ALL MEN BY THESE PRESENTS:

"That I, William J. Walker of Newport, in the State of Rhode Island, do hereby give and grant to the Massachusetts Institute of Technology the proceeds in money of six hundred shares in the Old Colony and Fall River Railroad Company, belonging to me, provided that there shall be subscribed or pledged by persons of supposed responsibility on or before the tenth day of the present month of April, an amount of money for the benefit, use, and endowment of the aforesaid Institution, which, when added to the sum hereby granted and given by me, shall together amount to not less than one hundred thousand dollars, and thus enable the said Institution to comply with the terms and conditions of an Act of the Legislature of Massachusetts so far as to acquire and make available for the purposes of said Institution a certain parcel of land located in Boston in the State of Massachusetts, and which has been granted by said Act to said Institution.

"In testimony of the foregoing Instrument, I, William J. Walker, have hereto affixed my signature and seal in Newport aforesaid on this second day of April in the year Eighteen Hundred and Sixty-Three.

"(Signed) WILLIAM J. WALKER."

Subsequently, by arrangement between Doctor Walker and the Corporation of the Institute, the property specified in this deed of gift was returned, and the sum of $75,000 in cash received in its stead.

In this almost dramatic way the expiring charter of the Institute was saved.

Again, in April, 1865, two months after the opening of the School of Industrial Science, when its prospects were far from encouraging, when all the money that the Government of the Institute could command must be put, as

President Rogers expressed it, "into brick and mortar," aid came from the same generous source. For it was found that by Doctor Walker's will — he having died at Newport on the second of the month — the Institute, the Society of Natural History, Tufts College, and Amherst College were made residuary legatees of his estate of more than a million dollars. Although, to avoid litigation, these beneficiaries consented to a modification of the original terms of the will, the Institute eventually received a practically unrestricted addition to its scanty funds of not less than $200,000.

Dr. William Johnson Walker, this earliest large benefactor of the Institute of Technology, was the second son of Major Timothy and Abigail (Johnson) Walker, of Burlington, Mass. He was born at Charlestown, Mass., on the fifteenth of March, 1789, was prepared for college at Phillips (Andover) Academy, and was graduated at Harvard in the class of 1810. He first studied medicine, as was the custom in those days, with an active practitioner, Dr. (afterward Governor) John Brooks, of Medford, and was thereafter graduated at the Harvard Medical School in 1813. In the same year he received the Boylston Medical Prize for an essay on hydrocephalus.

Sailing for Europe almost immediately upon graduation, in a privateer fitted out to prey upon British commerce, he had the singular good fortune to enter the Paris hospitals at a time when the sweeping conscriptions of Napoleon had taken away almost all the younger French medical men, and had put the care of the sick practically into the hands of foreigners. After this unique experience under the most eminent French surgeons, he went to the London hospitals, studying and working for six months under Sir Astley Cooper.

After a training so unusually broad for those early days of American medicine, Doctor Walker settled in Charlestown, practising his profession there for thirty years with signal success, performing nearly every one of the capital operations in surgery, attaining a wide reputation as an anatomist and pathologist, and guiding the studies of more young men than any other New England physician, not of the medical schools, of his time. He served, also, as physician to the Massachusetts State Prison and as consulting surgeon to the Massachusetts General Hospital.

Retiring from his profession in 1845, Doctor Walker removed to Boston, and interested himself with great success in manufactures and railroads, then entering upon a period of wonderful development. He thereby amassed a fortune large for the time, a fortune the greater part of which went to the furthering of education and other good works. So completely did he dissociate himself from his profession when he made this change of residence that thereafter he steadfastly refused to prescribe for even his closest friends. Late in life Doctor Walker changed his residence to Newport, R. I., where he died, on the second of April, 1865, in the seventy-seventh year of his age.

Of a singular and somewhat perverse disposition, of a hot and hasty temper, decided in his opinions, and often harsh in manner, Doctor Walker's enmities were as bitter as his friendships were devoted. His worst side seems to have been shown toward his fellow practitioners, his best toward young medical students, to whom he was always ready to give help and advice, and toward the poor, who benefited greatly by his charity. Shrewd in his judgments, keen in business, of a dry and pleasant wit, yet obstinate and sometimes overbearing, he was a type of man com-

At Home & Newport R.I. July 2. 1864

Dear Sir I received your note of June 29 with the pamphlet accompanying it: "Scope and Plan of the School of Industrial Science of the Mass Inst. Whole of Technology": I have read the same with great pleasure and am neither able nor desirous of altering it in any point for the better: It meets my unqualified approbation = God Speed the Institute::

I should not wish the Plans copied on my account. I am satisfied all is going on well: I can do but little mental labour::

When you write Professor Rogers, give him my best compliments and wishes for health, happiness, and prosperous visit to Europe, with safe Return

I am Dear Sir, Truly and Sincerely Yours & William J Walker

When can we complete & collect the subscriptions for second Building, I wish to have it done

mon in New England, a type analogous to its unfriendly and yet beneficent climate.

This almost providential gift of Doctor Walker's, and his subsequent equally welcome bequest, greatly stimulated the work and enlarged the aims of the nascent Institute, exerting no small influence upon its entire subsequent career. The gift, President Rogers declared at the meeting of the Government called to accept it, opened a "glorious prospect" to the Institution, but it also laid upon it "heavier responsibilities," so that "it had become still more incumbent upon both the officers and members of the Institute to strive to the utmost to form and sustain for it a character which should place it in the front rank of learned associations of a similar kind." And again, writing to his brother Henry, in 1865,[1] President Rogers refers to the lately announced bequest of Doctor Walker as a reason for projecting the work of the school upon a much larger plan than had seemed before possible.

It is not strange, then, that Doctor Walker, although in Newport and mortally ill, was, in the two years prior to his death, kept constantly informed of the progress of the Institute, and frequently consulted in relation to the many questions of policy arising in the launching of a project so new and intricate. The following interesting letters from President Rogers[2] well show this:

"1 Temple Place, Boston,
"April 14, 1863.

"Dear Sir: — It gives me great pleasure to comply with the vote of the Institute of Technology, requesting me to communicate the feelings and views of the Institute in relation to your recent donation.

"In doing so I forbear from any added expression of our gratitude further

[1] See "Life and Letters of William Barton Rogers," Vol. II., p. 232.
[2] "Life and Letters," Vol. II, pp. 159 and 163.

than to say that every member of the Institute acknowledges and will ever remember this generous and timely aid, which, besides securing the State grant of land for our immediate use, places our enterprise in a position to command the confidence as well as the helpful sympathy of the public.

"Neither will I obtrude my own feelings further than to mention the delight with which I learned in the most critical juncture of our affairs that so strong an arm was stretched out in support of that popular practical education which it has been my most earnest effort to promote.

"The best evidence which my colleagues and I can furnish of our appreciation of your aid must consist in our faithful effort to make your benefaction productive of the greatest good to the greatest number by causing the Institute to dispense as widely as possible the blessings of sound practical and popular education.

"Permit me to say that it has given me especial gratification to find from conversation with my friends, Mr. Tobey and Professor Wyman, that the views on elementary and practical education and the methods of teaching, which I have long entertained and endeavored to put in practice, are, as far as I can see, entirely coincident with your own.

"To teach exactly and thoroughly the fundamental principles of positive science, with their leading applications to the industrial arts, and to make this teaching as widely available as possible, are the cardinal ideas of our proposed School of Industrial Science. I need hardly add that in carrying them into effect the Institute will be glad to receive any suggestions with which you may please to favor them.

"I remain very gratefully,

"Your obedient servant,

"William B. Rogers."

"1 Temple Place, Boston,

"May 4, 1863.

"Dear Sir: — At the risk of repeating what may be in part already known to you, I undertake the pleasant duty of telling you of the favorable action of the Legislature on the two subjects connected with our Institute, which have come before them.

"You will, I am sure, be glad to hear that they have repealed the ungracious condition accompanying the grant of land on the Back Bay, and the Institute and the Natural History Society are now relieved of possible liability connected with the sales of the surrounding land.

"They have, moreover, shown their appreciation of our claims by appropriating to the active operations of the Institute *three tenths* of the proceeds of the public lands granted by Congress to Massachusetts, for the promotion of education in Agriculture and the Mechanic Arts. What may be the value of this appropriation, when realized, and within what time it shall become available, is, I presume, somewhat uncertain, but the amount, it is thought, will reach one hundred thousand dollars. By a separate Act, the Legislature have given the remaining seven tenths of the grant to the formation and endowment of an Agricultural College. Following the suggestion of the Governor in his inaugural address, a strong effort was made early in the session to secure a union of this entire prospective fund with that of the Bussey estate, and to make the Agricultural College and Institute of Technology parts of a grand plan centering in Harvard University.

"The latter proposition, suggested at the hearing before the Legislative Committee, met with the instant reply from myself and others that the Institute had from the beginning determined to stand alone, that its independence was essential to its success, and that it would accept no grant from the State, or from any other quarter, which should in the slightest particular interfere with this independence. After hearing our statements and canvassing the subject very fully on several occasions, the committee abandoned their original purpose, and framed the two bills, which have been enacted by the Legislature, and of which I have already communicated the substantial features, making the Agricultural College an entirely distinct institution, and giving the Institute the above-mentioned share of the Congressional grant, with no other condition than that the Chief Justice of the State, the Secretary of the Board of Education, and the Governor shall be *ex-officio* members of the Government of the Institute.

"We are now busy planning our building for the School of Industrial Science, and thanks to your munificence, we hope soon to see its foundation laid.

"Believe, me, dear sir, with great respect,

"Yours truly,

"William B. Rogers."

Doctor Walker's gifts to the Institute of Technology, while practically unsolicited, were not the result of impulse. He gave to the new institution because he believed in its general purpose, and foresaw its power for good to the

community. Some of his views in regard to the policy of the School, "views entirely coincident with," as President Rogers writes, "his own," can be gleaned from his letters, and from contemporary statements. It was his great desire, as declared by his friend, Mr. Tobey, that the Institute should maintain its individuality, and should have as its sole aim "to afford the greatest good to the greatest number." He hoped, furthermore, that gifts subsequent to his might be equally unrestricted, so that the development of the college should be wholly unhampered, and that they might be so many and so large as to permit of the educating there of any ambitious young man, no matter how limited his purse. He laid strong emphasis upon a thorough teaching of mathematics as a foundation for all work in science, and expressed the hope that, so far as possible, young men of zeal and teaching capacity, rather than old men of mere high professional reputation, might hold professorships.

The frontispiece is from a portrait, painted by Henry C. Pratt, in 1866, now in the possession of the Institute.

METHODS OF TEACHING ENGINEERING[1]

BY TEXT-BOOK, BY LECTURE, BY DESIGN, BY LABORATORY, BY MEMOIR

In order to secure the best engineering product in any case, the engineer, he who follows the profession of engineering, must understand the nature of the material employed, the use to which it is to be put, and if it is to be a machine, the nature of the article it is to produce. He must also understand the methods in use by which the material can be brought into the required form. In a similar way, the engineering educator, he who follows the profession of engineering teaching, in order to reach the best results, must well understand the nature of the material he is to use, his pupils; he must appreciate thoroughly what his pupil shall be expected to do after leaving his instruction, or to follow the simile of the machine, he should understand the engineering works which his pupil is to design and construct after graduation; but the educator must also understand the educational methods by which his pupils are to be rendered fit for the work which they are to do.

The engineering teacher then must of necessity be sufficiently an engineer to be able to appreciate adequately the nature of the engineering works which the educated engineer may be called upon to design and to construct. That the teacher should be facile and expert in actually designing and constructing such work is not essential. Yet it is true that actual experience in engineering practice is, and always

[1] Read before the Society for the Promotion of Engineering Education, August 18, 1899.

must be, of great value to the teacher; the assurance that it gives to the public and the pupil alike of competence in this particular, is so important, that in the future as in the past it will often, and with much propriety, be insisted on as a necessary qualification for the engineering teacher.

Furthermore, it is difficult at the best for any one to determine, without extended trial, the teaching ability of a young candidate for the position of engineering teacher; it is even more difficult, when, as is often the case, those charged with the selection of teachers are not themselves trained teachers, and often fail to appreciate the importance of the ability to teach. The ability in engineering of an applicant for a position, on the contrary, may have been tested, and can commonly be rated with comparative ease and with reasonable accuracy. It is not improper then that engineering educators should have been selected with reference more to their engineering than to their teaching ability. The tendency in this direction is enhanced by the fact that to us, as engineering teachers, the problems of engineering often seem more attractive than the problems of education. With the advantages of engineering experience so evident, and the taste for it so general, it has naturally resulted that engineering teachers have received little or no formal instruction or training in the study of the material, their pupils. Nevertheless, it is true that for the proper understanding of the engineering student whose nature is not quite that of boy, nor yet of man, but somewhat of schoolboy and man combined, and for the adaptation of the instruction to the needs of the pupil, both as to substance and as to methods of presentation, the teacher is demanded rather than the engineer. The writer will readily acknowledge that the engineer may readily become a skilful teacher after practising engineering, if he appre-

ciates the importance of the teaching side of his work, and perhaps the desirable preparation is of this sort.

In the judgment of the writer it admits of no doubt that a suitable course of study in psychology could be made of very great value to any of us as an aid to understanding human nature and correctly judging the character, the qualities, and abilities of our pupils. With this phase of preparation, however, this paper does not deal. Neither does it deal except incidentally with another side of the work of teaching, of superior importance, the determination of what subjects or what parts of subjects shall form the course of study; this matter has already, in many cases and in many ways, been treated with ability before this society.

The purpose of this paper is rather to discuss, as a part of the work of teaching, the method of presentation, rather than the substance of the matters taught. Even here we can hardly reach correct conclusions unless we have an adequate conception of what the finished product, the accomplished engineer, is to be, as well as what should constitute our part in the process of production. We receive him by no means in the rough, and part with him already a useful implement, to be sure, but requiring a further process to make him thoroughly fit for the uses intended.

For the finished engineer there is required suitable material upon which to work. Upon this must be laid a theoretical training in the principles applicable to engineering which shall be sufficient for the proper consideration of problems which he may reasonably be called upon to handle; and to this must be added, finally, experience, or a knowledge of facts and details necessary for the successful solution of such engineering problems.

It is not to be expected that any engineering college will so conduct its work as to give to any student both the theoretical training and the experience requisite for the successful engineer. What part then, in the work of producing the engineer, should the school undertake? Experience, as we understand the term, must be acquired in large part outside the school; the engineering college has neither the time nor can it have the facilities for imparting experience to the extent, and in the fashion, in which it is necessary for the thoroughly successful practitioner in engineering. The school should largely, if not entirely, avoid that part in the preparation of an engineer which can be as well accomplished outside the school. It should aim to do for the pupil those things necessary to him which he can expect to secure either not at all or with extreme difficulty outside the school.

The material furnished in the shape of pupils varies in different cases as to the amount and the thoroughness of work already put upon it. The product which the engineering college should turn out as graduates, is young men who shall have (1) a foundation-training in theory applying to engineering, which shall be at all events sound and effective as far as it goes, and if possible extensive enough to meet all reasonable demands in the future at the hands of those requiring the services of engineers; also (2) sufficient familiarity with the applications of theory to practice to make the former of direct practical value. These two constitute a foundation or preparation sufficient to combine with experience in making an engineer (so far as training in contradistinction from talent or genius can make an engineer). There should be added, however, to secure the best results, (3) sufficient experience or contact with the apparatus, processes, and materials of engineering to assure the

securing of positions where the necessary additional experience can be secured to supplement the training in theory already acquired; (4) some knowledge of principles, processes, and methods in use in connection with engineering enterprises, so that breadth, as well as knowledge of detail in that business, may be easily acquired; and (5) a general liberality of education such as to allow a proper conception to be entertained as to the relations which any large enterprises connected with engineering bear to the political and social conditions existing in the world.

For the substantial foundation of theoretical training, which is the first requisite of the engineering course, the text-book is well-nigh a necessity. Much of this work is mathematical; nearly all of it must be in its quality exact. The text-book tends to exactness, while the contrary is true of the lecture. A failure of exactness in the latter may be chargeable to the lecturer, to the student, or to both. It cannot be certain that the lecturer will be exact in what he gives; it is quite certain that the student will often be inexact in what he acquires from the lecturer. So far as the subject requires the mastering of principles, or the acquisition of methods of reasoning, recurrence must often be had again and again to the statements made, possibly in order merely to understand them, certainly in order to acquire a grasp sufficient for demonstration, or for incidental use in later operations. Furthermore, a lecture is unsatisfactory unless directly, readily, and clearly understood. A text-book, on the contrary, especially in mathematics, should often state facts or propositions in such sequence that a definite effort is absolutely required on the part of the student in order to reconcile a statement with that which precedes. In many mathematical subjects the best text-book is the one which, in passing from one step to the next,

leaves a gap sufficient to demand substantial work from the student, but which is graded carefully enough so that each step is readily possible. A student grows strong by exercise, by the work he does himself; not by the amount of material brought before him, nor by the efforts of his teacher. A common error in teaching, from the primary school up, is for the teacher to do overmuch of the work. The boy who is carefully carried over the stepping-stones which he should cross himself, is ill-fitted for the task of making his way through the hurdle race of life. It is to a considerable extent true that the requirement of individual work on the part of the student is the measure of a teacher's success, and failure definitely to exact such work in a course such as civil or mechanical engineering will be fatal to the strength and success of such a course.

It has been stated that "In pure mathematics the text-book is more important than the teacher." Without endorsing the proposition in that form, it is certainly true that with a good text-book, an ambitious and able student will prosper, either with a very good or with a very poor teacher. In the latter case, with nothing to hope for from his teacher, he will depend completely on his own resources, and gain tremendously in strength. With a teacher just bad enough to drag him past his difficulties, he may be coddled into a state of flabby weakness. The text-book, too, suggests the recitation, and this in turn requires from the student a strict and prompt responsibility to the teacher for the improvement of his opportunities for study. While it may seem that this ought not to be necessary for students in the junior or senior years of the engineering college, yet in the experience of the writer it is a definite necessity in order to secure the best results. We are in this matter forced to act on what is, rather than what ought to be. For

many reasons the writer firmly believes the text-book to be the most important of the methods to be used in the education of the engineer.

But the text-book is insufficient in itself. While its lessons are food of the best sort, this needs to be made palatable, and for the best results even in teaching theory, the interest of the student must be stimulated. In all teaching, in fact, it is essential that the interest be maintained. Even in athletics it is largely recognized now that formal exercises are in general less effective than are athletic games where interest in the sport renders the work more spontaneous and invigorating. The interest of the student, then, must be maintained. The text-book is ill adapted to maintain it, and lecture, laboratory, and design must be made use of, in part to do away with monotony ; in part to serve the necessary purpose of connecting theory with practice ; and in part to illustrate and to enforce both by means of repetition and by emphasis the valuable lessons which the text-book lays down.

The lecture is of exceptional value in connection with, and as a part of the class-room work. A part of the exercise naturally devoted to recitation may be used with advantage to explain points of obscurity, to describe the practical application of the theoretical work, the dangers of misuse, the precautions necessary in securing data, the standard of precision necessary in measuring or in calculation, or to do whatever else may serve to cause the student to appreciate the matter in hand in its various bearings. The skilful teacher in such ways may so thoroughly vitalize an otherwise dry or almost dead subject, as to cause the students, or many of them, to be actuated by a desire to understand a subject, rather than to pursue it simply as a required task.

Design serves a different purpose. In connection with text-books, ordinary problems serve to give point to class-room work, and if arranged as they can be, to require from the student something more than the substitution of values in a formula, will secure something of the intellectual exercise which is desired to develop the mental fibre of the student. Work of a similar sort is done most excellently by the exercise in design. Its purpose should be, without fail, to enforce the theoretical work in which the student has been prepared. It is most desirable that the design should also represent modern practice, and in this way not only connect theory with practice, but also give the student this much of useful knowledge and preparation for the actual practice of his profession; for this can be done for him without the loss of valuable time and opportunity for training. It is important, however, to bear in mind that the controlling factor in the selection of the problem in design, shall be not the value of the student's result, but rather the quality of the design in introducing again, and thus enforcing, the theoretical work previously or contemporaneously undertaken.

Oftentimes an adequate understanding of a proposition comes only from persistent repetition. A principle of mechanics first taught in the course in physics, is repeated in applied mechanics, forms a part of the instruction in a course in bridge work, and finally becomes definitely a part of the student, perhaps, only when enforced by an exercise in design. A variation in the amount of design work required of different students having the same amount of text-book work, will show its effect in the examination on the latter subject. However much we may think that it ought to be unnecessary, it will not do for us to shut our eyes to the fact that where a definite understanding of theory

is necessary, a thorough drill and reiteration of principles is absolutely essential.

Design, then, is valuable in enforcing theory, in connecting theory with practice, in giving to the student something of the experience with the processes and materials of engineering, and in acquiring the manual skill in drafting which is necessary to assure him of employment in positions where there will be opportunity for his experience to be extended after graduation. Design is certainly of great value as one of the methods of teaching engineering.

What is true of design is also true to a large extent of the laboratory as a method of instruction. As a means of fixing and illustrating principles, it is of incalculable importance as an aid to the teaching of theory. In introducing the student to the apparatus, and allowing him the use of materials of engineering, and to that extent allowing theory and experience to unite in making him at once in some degree an engineer, its value is considerable. But the laboratory does something more for the student as an educational factor, in that it trains the eye and hand, in addition to the faculties reached by the text-book, and thus largely adds to the all-round development which is necessary to the man who is to have in its proper sense a liberal education. The writer is sufficiently an optimist to believe that the extraordinary development in recent years of the laboratory as a part of the engineering college, is due to its intrinsic merit. It is nevertheless true that the older graduate engineers, the men who have to a large extent advanced the reputations of the institutions they represent, these men had not in any considerable degree the benefit of laboratory instruction. It will not do to shut our eyes to the fact that the laboratory is a menace as well as a boon. Its work is attractive to teacher and student alike. The

preparation it constitutes for the immediate usefulness of the graduate is such as to encourage its undue use, not only in the amount of time granted for it, but in the nature of the work accomplished. The laboratory should be used primarily as an indispensable aid to the other work of the school; so far as its work is carried on either mainly with reference to the practical value of its results (as in research) or in order to impart great facility in manipulation to the students, its value as an element of teaching is largely destroyed, and its work is dangerous in its tendency to interfere with what ought to be considered the more legitimate work of engineering education. It will be understood, of course, that the field-work of civil engineering is properly regarded as laboratory work.

The memoir, if we may use a word already sometimes employed for the purpose, is substantially a form of laboratory work in which the library is the work-room, and books on engineering are the pieces of apparatus used, and where a certain subject is assigned, upon which the student shall make his report in writing. The method, by whatever name it be called, has probably been less used in connection with engineering instruction than with such subjects as history or economics, which are generally more closely connected with literary courses. The method has many points of merit. It is very effective in stimulating the student's interest. It calls for substantial and discriminating work on his part; it calls for the exercise of mental faculties less often called into play in engineering courses. The information he secures may be made valuable to him. He becomes familiar in the proper way with the library, with books themselves, materials from which the engineer will find it necessary to acquire much information and instruction. As an exercise in English this work has

a peculiar advantage, from the fact that the substance of the subject will so occupy the student's mind, that the form of expression will be sufficiently subordinated to give encouragement to a freedom of style and individuality often liable to be lost where the student is oppressed by the idea that something special in the way of literary effort is expected of him. Variations in detail of the method of teaching by memoir will readily suggest themselves. A reference to a subject in a foreign text-book or periodical will render the exercise one in language to a greater extent than if the article be in our native tongue. The writer has for several years assigned certain subjects to his students, who, after preparation for the exercise, take the platform and themselves lecture to the class. If not carried too far, this work is profitable to the lecturer and without material sacrifice to the other students. The memoir is especially well adapted to those institutions where small classes are possible.

Thesis might perhaps be included as a method of instruction. Its work, however, comes largely within the lines of method classified as design, laboratory, or memoir. As an element of instruction it has the special merit of developing the spirit of self-dependence in the student to an extent not easily secured in any other way. It is the writer's opinion that the thesis, however, should be used primarily for its teaching value, for its effect on the student's education rather than as a means of gauging the student's ability, or for the purpose of securing results of scientific value. In fact the primary purpose of all teaching should be the development of the pupil rather than to determine the measure of his performance. The examination itself may have more value in requiring a review, demanding faithful attention to duty, and in cultivating in

the student the ability to work under pressure, than it has as a test of the student's ability and faithfulness.

The lecture, too, deserves a larger place than has previously been given it here in connection with instruction by text-book. Properly used, it may be made a very important factor in the education of the engineer. Carelessly used, it may consume much time with little profit. That it can be used to advantage as compared with text-book work for theoretical instruction, where exact knowledge and understanding is required, the writer does not believe. But it is possible to use it to great advantage in bringing before the student many phases of practical engineering work and method in such fashion as to familiarize the student with the many ways in which theoretical considerations enter into the general principles and into many of the details of engineering practice. The principles underlying good, even advanced, practice may be brought to light, and the student in this way acquire directly from his teacher what may properly be called engineering experience; and what is equally important, he may be so schooled in the process of building his observations of things engineering upon his strong foundation of principle and theory, as to be able later to quickly and accurately acquire the true experience and engineering judgment by processes with which he has become familiar in the lecture. Facts observed can be arranged in the mind of the educated engineer in proper order with reference to what he knows is correct in theory, and an application, in any case, of theory suitable to the existing facts, will thus be made to form a most important part of what is called engineering judgment. So far as a lecture is devoted mainly to the mere description of engineering details, its value as a means of instruction is distinctly lessened, if not destroyed. It

attempts to do what can as well, perhaps better, be done elsewhere, and it is justified, if at all, mainly on the ground of fitting the young man for immediate employment, where opportunity for better things awaits him; it hardly allows him to best improve his opportunity for school training.

Where the lecture system is adopted for subjects of considerable importance, five or ten minutes of the time allotted may be used for the student to give written answers to questions presented. The immediate accountability for an understanding of the last lecture, will secure from the student a different attitude of interest, and a more definite understanding of the subject presented.

The lecture may, however, perform another function, and be used in certain cases somewhat in the way of recreation, of relief from the many severe subjects forming the course. Such lectures may be of great value, though they attempt no more than to enlarge the horizon, and cultivate the proper point of view from which to observe the bearing of engineering upon large enterprises, and serve the purpose already stated of acquiring a proper conception of the relations which any large enterprise connected with engineering bears to the political and social conditions of the country or the world. As an example, a course in railroad management as a part of a strong course in civil engineering, may advantageously be conducted by lecture for this purpose.

Different subjects may properly be taught by different methods; and the adoption of the method used in any case may depend in a large degree on the character of the subject, but in some degree on other conditions, such as its importance in the general course of which it forms a part. The lecture course which seems well adapted to instruction in railroad management as a broadening element

in an otherwise severe course in civil engineering, might demand the use of both text-book and memoir if the subject should become one of primary importance in a course to prepare young men directly and especially for railroad operating. The use of different methods may be justified, too, even by the abilities and tastes of the teacher. Some teachers are definitely strong in recitation work, and decidedly weak in lecture. Others are admirable lecturers and poor in recitation. It is often a matter of judgment not only as to what subjects shall be treated in a general course, but also as to the way in which the subjects shall be treated; the range of opportunity may be so great that either of several subjects will serve admirably for the purpose of both training and conveying information; the lines in many cases are not rigid. Some latitude may with great propriety be granted so that each instructor may be free to use the method which allows him to do the most effective work in reaching the student and touching the chord which will most freely respond with effective effort.

While the writer believes that teaching by text-book should form the backbone of a course in engineering, he further is convinced that the use of various methods, rather than any one alone, will best develop the capacity of the students in various directions. One method will demand the use of certain faculties and another method is calculated to develop latent powers, and together these will result in securing breadth as well as depth of training.

Similar results are known to follow from the contact of pupil with various teachers. Among the most effective factors in education in many cases is the inspiration which the scholar derives from an able teacher. It is true also that not any single teacher brings out the best there is from every scholar, nor does any teacher act with equal efficiency

upon the various qualities of mind and habit of any student.

It follows, then, that the best results are secured when there are a variety of studies, when there are several methods of presentation used, and when the student is brought in contact with a number of teachers. By such means the necessary interest is maintained, and a broader and more perfect development of mind is assured than is possible under a single method or under any one teacher; and as one among certain advantages which the larger colleges of engineering possess over the smaller, this should not be underestimated. C. Frank Allen, '72.

INSTRUCTION IN ENGLISH AT THE INSTITUTE

The aims of the student at the Massachusetts Institute of Technology have, naturally, influenced its methods of instruction in English composition. At the Institute the student looks for success in what he shall build on foundations of physics, chemistry, and mathematics. His demand, therefore, on the English department is that it teach him the art of expression in written language for use as a tool in his technical work. He needs to make his examination papers and graduation thesis good in expression as in learning; his chemistry note-books orderly in statement, their sentences clean and true; his architectural essays, mining engineering "memoirs," and descriptions of machines as unhampered, stable, and well-proportioned as the building or machine itself. No essay made up of disconnected thoughts will serve him. In a system of philosophy there may be gaps between the stars, but there may not be one

break in a system of water-works. By this need of coherent organization the student's work as a scientist is limited. In explaining his work, therefore, he needs from the English department not so much stimulus to more thought, as drill in stating the thought he already has. To meet this demand of the Institute the department has, naturally, drawn largely both from methods of teaching in use at Harvard University, and from suggestions everywhere; but it has had to adapt these methods to its own needs. As a result there have come into use a number of devices which, although not new in principle, are to some extent novel in application. Some of the most successful of these it is the purpose of this paper to outline.

For work in writing English, the first year class is divided into sections of about fifty men each. Each section meets twice a week. The class-room work consists of lectures, recitations, and writing. Every week a theme is due of from three to four hundred words in length, written on a prescribed form of paper. The student is required to follow a conventional form of endorsement, to write legibly, to indicate his paragraphs clearly, — in short, to be workmanlike in the handling of all these mechanical details. In addition to class-room work and theme-writing, the student may talk over his work as much as he desires during any of the numerous office hours held by each instructor.

At a technical school, where organization is essential, any confusion of thought has to be met with peculiar rigor. English composition, like other arts of expression, is more open to this confusion than is work in acquiring learning where the science or language offers itself to the student problem by problem, word by word. To gather ideas is, in some ways, easier than to make them properly depart. A difficulty in selection meets the student when he first

seriously tries to write, and it remains a difficulty to the end. In order to lessen this, it has been found most helpful to place emphasis on three things: the reader, the subject, and the point of view. The need of thorough drill in these is nothing new. The special idea gained from the Institute in connection with them is that they are really preliminary to a drill in the other principles of composition; that by an understanding of them at the start much which would otherwise continually harass the student in his study of unity, coherence, emphasis will be unconsciously avoided.

It has been found of more benefit to insist on a study of the personality of the reader than on that of the writer. The aim in a scientific school is to explain a definite object to a definite reader. The student, therefore, is reminded that there is some definite person who looks for letters from him, and to whom he writes with a certain degree of willingness, telling what he has seen and done, and what has entertained him. He is then shown that later he will write to his employers, and to the men with whom he deals in his business or profession; and that as he gains knowledge of value, and skill in the use of it, he will find more and more people who desire to hear him, till his audience may range from a railroad board, wishing to listen to his plan for a new bridge, to the whole world waiting for his explanation of a startling discovery. Thus he sees that only in this coherent fashion can a man's audience grow, and that its growth depends at every stage upon his success in interesting a particular man or a particular class of men. A recent Lowell Institute lecturer chose two men whom he knew, as representative of those he wished to interest, and talked to them alternately. By this method he reached a majority of his audience at all times. A student naturally seldom writes a letter unless he writes it to some particular

friend. He is shown that there is little reason why he should do any writing otherwise, and is taught to direct his theme work and all his practice writing toward particular persons. The benefit of this is invaluable. With the people he writes for standing before his mind, though they may never read his work, he knows equally well what to say and what to leave unsaid, whether it be the man who reads his graduation thesis or the laborer to whom he sends directions for a day's work.

As the student advances in this power, it has sometimes been found of use to drill him in an abstract distinction. The scientist learns to respect the line between the intellect and the feelings. It has often been found wise to teach the student to write to his reader's intellect only. For this purpose he is given the working assumption that he can count upon that person's interest, so long as his writing is clear, concise, accurate, and flexible. That the student may understand the distinction between writing to the intellect and writing to the feelings, he is shown that, in description, if a writer could depend on perfect impartiality of mind in his reader, it would only be necessary for him to state his view of Trinity Church with such clearness that the reader must see it as he sees it. Because, however, the reader may consider the architecture of that particular building faulty, and so be predisposed to blindness toward another view than his own, it is necessary for the writer not only to make his description clear, but also to place it before his reader in such a way as to win his consent to listen with a mind at least temporarily free from prejudice. A story, to be understood as it was intended, must not only be clear; it must have added to it such qualities as to allay antagonism and consequent blindness on the part of the reader. So the political speaker has not only to de-

velop his points, but to win his way among the crowding worships and ambitions of his audiences. These illustrations are made the basis of exercises in the class-room. The written exercises are then discussed with each writer in private consultation. The point insisted on is that, like two movements in fencing, gauging the knowing reader and gauging the feeling reader are to be studied separately, and are then to be combined.

Along with drill in understanding the reader, comes drill in the choice of subjects. One method of helping the student to answer the question: What shall I write about? has been to get from instructors in other departments lists of subjects which closely concern the student's work, and in the class, by informal talks, to excite a general discussion upon each subject. A half-hour of this will often result in a lot of ideas as heterogeneous as the spoils of a high school botanical expedition just in from its first collecting. The second half hour must be devoted to sorting and apportioning the material. In the course of this it is often amusing to see in some minds the dawning of the idea that all the world is not to be written about at once. It is of no consequence that a student may come to "consultation" next morning with the grief of "But I can't write three pages on that." All comes in time. It is of great consequence that he has at last even a page and a half "on that" and on nothing besides.

Methods like this, in which the assignment of the subject comes chiefly from the instructor, are dependent for their success on his ability to suit his class. But he does not forget, and he tries not to let his men forget, that it is only his secondary task to interest them; that his first business is to teach them to write. Certain classes of subjects are most swiftly helpful to certain results, and in these

matters a wise teacher is the best judge. If his class will not work blindly for him during limited times, improving in spite of themselves, he is hardly equal to his duties.

In another method of helping the student to find subjects, each man is asked to make a list of the things he has done, without regard to how much or how well he has done them. These lists are carried along for several weeks until that of each student is as complete and as detailed as possible. If he has ever fished, then "Fishing" is sure to be in the list, and not only "Fishing," but such restriction of the subject as "Fishing for Trout in the Brooks of Southern New Hampshire." The necessity of writing this list lies in the fact that there is a great difference between tacitly acknowledging a thing, and plainly stating it. A man may easily feel that he has been foolish; it is vastly a different thing for him to say in cold words, "I am a fool." The next task in connection with the list is for the student to star on it all things regarding which he considers his knowledge somewhat accurate. By "somewhat" is meant that his knowledge is elementary rather than superficial, that however little he may have done, his knowledge, as far as it goes, is thorough. The starred list will be longer than the skeptical reader may suppose. In the third place, the student adds on the list a second star to such subjects as have thoroughly interested him. Since each of the things in this list may be considered from many points of view, he has here an inexhaustible supply of subjects for themes.

Next to the relief which the student feels when he is required to write on only a part of existence, on one character in a book, on one part of a machine or of a chemical process, comes his relief when he has clearly mastered the

other fact that he need write about that part from one point of view only. In training himself in this direction the student is compelled to distinguish at the start, and always to keep distinct, the physical and the mental points of view. Often one of the first themes he is asked to write is a description of his quarters. Here at the most he is allowed two physical points of view. He may stand in the doorway, and move his eyes slowly around the room from left to right or from right to left, or from the first thing that catches his eye to the left, as far as he can see, and then jumping back to the striking object, from it to the right as far as he can see. He thus in some consecutive manner gives a clear and concise first picture of the room. He is then allowed to walk to a chair, being sure to make his change of position absolutely clear to his reader, and, sitting there, to describe in the same consecutive manner what he can see without straining his neck. It requires training before the student acquires the ability to make the space-relations of the furniture, the windows, and the pictures, photographically clear to his reader. He is then asked to write another theme sitting in the same chair, and looking at precisely the same objects. This time, however, while writing with equal clearness, as far as space-relations are concerned, he takes on the mental point of view of some particular character. Perhaps it is his own satisfaction with his new quarters, and he praises the hanging of the pictures and the coloring, or calls up reminiscences from trophies. Perhaps he is dissatisfied, or perhaps he plays at being the fastidious aunt, or the appreciative uncle, or a bored friend waiting for him to get dressed for dinner. Thus spring up from this one room the subjects for innumerable themes, and by them the student learns thoroughly what a point of view is,

the difference between the physical and the mental points of view, and how to combine them.

The discipline of mind which comes to the student from a careful study of his audience, and from learning where to choose and how to limit his subjects, is perfected by constant drill in the point of view. When any topic of discussion is widely before the public, and unfounded opinions exist everywhere, it is refreshing both to the students and to the instructor to have an exercise in class called the "point of view vote." In the midst of all the cry about annexing or not annexing the Philippines, one class was asked to write ten lines deciding on the situation from some definite standpoint. Nearly every man in the class, thus restrained from general ideas, wrote a statement which, from the very narrowness of its views, had some recognizable truth. One wrote what effect he thought annexation would have upon his father, who was a manufacturer of cheap furniture; another took the point of view of his brother, who was a soldier in Manila. When these statements for and against annexation were read, the class realized as never before how the right outcome of a popular vote is dependent not on each voter's thorough knowledge of all the points at issue, but rather on each voter's clear vision with his own limited outlook; they saw that accuracy with reference to individual points of view, although each be necessarily incomplete, and even selfish, most surely subserves a decision of the majority which shall be unselfish, because most widely accurate. By this drill in voting the student gains some understanding of the limits of his work. He sees how the specialization which the Institute demands in his study will be most helpful to him in his broader practice, where his task will be to express effectively the ideas he has acquired, and will constantly acquire. The confusion in his mind at

his first attempt to express himself he learns steadily to control by clearer understanding of the three preliminary demands of English composition: Knowledge about a definite reader, faithfulness to the subject in hand, and some sacrifice of the pleasure of wandering around an object to the necessity of greater accuracy gained from one longer and partial view.

Any success in original work even in mechanical branches must depend upon the development of the imagination, and this faculty may be strengthened by drill in the description of objects from an unusual point of view. Subjects for this purpose are always at hand, such as the autobiography of a burnt match, the ideas of various animals about men and women, why Kipling's elephants object to small dogs, and a blind man's sensations and deductions.

Under the methods so far outlined, the student comes unconsciously to a surprising skill in avoiding faults in unity, coherence, and emphasis. These methods and similar ones aid him in the understanding of principles, and in their broad application. By this means he is enabled to write a first draft which shall bear the test of polishing. Nothing is so discouraging to a writer as to find on rewriting that his first draft is fundamentally inaccurate. Nothing is more stimulating than to find that his work is roughly true and strong; that discarding a sentence or two brings out the one underlying idea which was there all the time; that smoothing down the links in the chain of thought reveals no flaws; that the addition of a sentence makes the weight of an existing idea right. A first draft is a sure indication of the quality of the writer's mind, and no methods aid the mind which do not directly train the writer in correct habits of observation and thought.

The methods which now follow are concerned largely with drill in the revision of written work.

Another way of emphasizing the importance of coherence has been an exercise in class called the view between sentences. The instructor reads a theme to the class and stops at some effective sentence. Each student then writes on a slip of paper the idea which he imagines will come next.

No device, perhaps, has been found of more use than that of having the student write the end of his theme first. To have his goal clearly before him is a great assistance in reaching it in the best and quickest manner. Work of this sort is especially useful at the Institute, where the object of the student is to make his way from port to port; where drifting, however pleasant, is not the duty of the hour.

Through all the work in unity and coherence runs the endeavor to impress upon the student the distinction between a complete and an incomplete idea. The instructor often writes on a theme all the questions that it raises in his mind. The student then arranges these questions in two classes: first, the questions which the work undoubtedly suggests, but to which the answers are not essential for clearness; and second, the questions to which answers are necessary for completeness of meaning. Answers to this second class he then incorporates. By much drill in this distinction between questions, the student learns what questions suggested add to the scope of his work but do not weaken it; what questions must be raised and adequately answered; and, further, what questions must not be raised at all. He thus perceives that completeness, though theoretically nonexistent, is for practical purposes attainable and necessary.

Though want of unity confuses, it often leaves in the reader a lack of ideas rather than a wrong idea. Similarly, incoherent work may do little positive harm. Where,

however, work has unity and coherence, the difference between the wholly right and the wholly wrong meaning may depend upon the importance attached to a single word. In one method of teaching emphasis the first step is for the students to exchange themes. Each student then summarizes in single sentences the paragraphs of the theme he has received. On resuming his own paper the writer sees whether he has succeeded in making emphatic the ideas he considers important; for his critic naturally puts down in each summarizing sentence the meaning most obvious to him. When, as often happens, the writer finds that a favorite idea has been overlooked, he learns how little he can count on a reader's sympathy or divination.

Every teacher is likely to adopt the custom of putting on the blackboard for class criticism examples from the themes of the class. Sentences in any way typical are selected, and in almost every batch of themes corrected are examples of success or of failure in the special points with which the class is just then dealing. No manufactured examples, as every instructor is aware, can serve so well. In the same line are examples from the speech of pupils in recitation. Accurate speech and exact statement orally, which must of course be insisted upon in all recitations, are perhaps of especial importance in classes in composition. Certainly at the Institute the oral sentence is deserving of unremitting attention. The scientist is in daily need of complete and concise definition and explanation, and for speech as much as for writing he must have every value and shade of language completely at his command. Slovenly and inexact expressions are at the moment put upon the blackboard, and commented upon by the class. No exercise is considered of such importance that it may not be interrupted for any device leading to accuracy of speech.

In the preceding paragraph it will have been noticed that the sentence was considered apart from its environment. This temporary abstraction has been found more and more useful at the Institute. The Harvard daily theme, consisting of a paragraph raised to the rank of a whole composition, has been one of the greatest boons to drill in English. No less helpful, it is believed, is the sentence also raised to the rank of a whole composition. Printed slips are prepared naming certain specifications for sentences. In addition to these specifications the student applies all the rules for the whole composition, choosing his audience, subject, and point of view with great care. He thus acquires a familiarity with sentence forms, and this leads him to distinguish more quickly the right setting for any given idea. He gains more and more acquaintance with the various functions of the participle, and with all the problems in structure which arise from the relation between substance and form.

Men at the Institute have to be constantly drilled in the difference between a general and a technical method of description. Among the exercises for training them in the use of words is a description of an experiment or a machine. The student first describes the machine in words intelligible to a small brother, and then in language suitable for a classmate.

Description accompanied by diagrams presents many difficulties. Every reader of illustrated scientific books is aware that the diagram and the text often confuse each other. If an incandescent light is to be described the class must first of all decide what diagrams are necessary. These must be clearly drawn and lettered. The text must not be a mere list of explanations of the lettering. It must be an independent description relying on the diagrams only when

these can make the meaning clear in shorter time than words. For every detail of the object some description in words is necessary; that is, the letter in the text referring to the letter in the diagram must always be a parenthesis and an amplification, never a substitute. The diagram should explain the text, the text should not explain the diagram.

At the same time the student experiences the pleasure of finding his most chance bits of knowledge constantly coming into use for illumination of his severe subject. The keeping of a commonplace book is urged, not for the cataloguing of dry events, but for the description one day of an incident, another day of a reflection, and so on, in as great variety and little space as is possible. In connection with this work the student may be asked to tell in class some short story or incident. The form in which he tells it is then commented upon by the instructor and the class after the manner of trainers in athletics. Insistence falls on the use of the five senses. In the description of a street accident the student must tell not only of what he sees, but of the sound and touch of the crowd as he pushes through; in a mountain climb, the taste of the night air and the smell of the woods. To gain accuracy in telling what he sees, hears, tastes, smells, touches, he is advised to phrase his observations to himself; not to be content with the vague feeling that a building is reddish in color, but to state to himself in words the exact particulars. By this habit the student becomes rich in material for illustration, and also finds that he wastes little time. Writing becomes an outdoor study. At the desk he does the least part of it. The value of time saved from chewing the pen handle in the life of a man so trained is as immense as the gain to commerce by one hour less in

transcontinental time. The rule that a man writes best on what he sees most clearly demands that he should look about him, and practise some minutes a day by speaking and writing in transparent expression of what he sees.

One method of reviewing in class any division of the subject which has been under consideration is to have each student set down on a slip of paper without his name a statement of what in that division has seemed to him most difficult. These slips are easily sorted, and may then be made the subject of question, explanation, or comment on the part of the pupils and of the instructor. This is, of course, simply a method of review which has the economy of taking up only those points which need attention.

As a preparation for taking notes in lectures, the last exercises in first year English are given to practical instruction in this difficult art. Suggestions are made of methods, and then follows actual practice. Brief lectures are given on subjects of general interest but not directly connected with composition. At first the student is given beforehand a skeleton of the lecture that he may appreciate structure; and this outline he fills out from the talk. At another lecture, in which the framework is tolerably clear, he is left to himself in discovering the main points. From this he is led to the familiar talk, in which the plan is obscure. Of course no great amount of time can be given to this work, but it at least gives the student some notion of how notes should be taken if at all, and warns him against the worst errors of ordinary note-taking. If after this the student fills his note-book with unimportant trifles, unrelated and ill-arranged, he is at least in a position to judge of the worthlessness of such bungling stuff.

The general conclusions which instructors at the Institute have drawn from their experience are naturally not widely

different from those of teachers in general. The technical nature of the school, however, keeps their work somewhat close to the strictly practical side of composition. The first step toward writing business English seems to be the gaining of a clear idea of a definite reader. Vagueness of conception of the reader inevitably produces vagueness of thought and expression. The fiction of the "average man" paralyzes the interest of the student, and gives to his work inconsequence. The expression of thought to a specified audience imparts self-possession and clearness. The step next in importance is that the writer shall cease to be troubled about his subject. It is the experience of instructors at the Institute that classes improve in all their work — from organization of the whole composition to range and accuracy in the choice of words — in proportion as the question, "What shall I write about?" becomes less frequent. To show the writer that he is to write about what he knows, that he shall concern himself first not with the question, "What shall I say?" but "What do I know? What do I think?" is to do away with the most serious obstacle which besets the student of composition. The third step is to develop a clear perception of the nature and use of the point of view. Accuracy of expression inevitably follows accuracy of perception; the writer who has made up his mind exactly what view, physical or mental, he takes of his subject, has gone far toward conveying his ideas clearly and forcibly. These three steps do not, of course, cover the whole steep road, but they do start the traveller well and firmly on his way.

Of evident importance is it that English work at the Institute shall not be narrowed by any influence of technical courses. It is largely through composition that the student should learn to extend his imagination beyond the

class-room and the laboratory. The facility and accuracy needed even for technical writing cannot be gained without practice in handling subjects of many sorts, while the development of the imaginative powers is for the instructor in composition at once one of the highest and most constant functions.

The methods of instruction in English composition are as various as the number of teachers, and for those given above no more is claimed than that they have proved effective in actual practice. The conditions at the Institute, as stated at the beginning, differ somewhat from those elsewhere; but the differences are not so essential as to prevent the application of most of these devices in any class-room. They are here set down in the hope that some teachers may find them helpfully suggestive in the matter of training pupils easily and pleasurably to write clear, concise, and intelligent English.

Robert G. Valentine.

THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION

On another page of this number will be found a paper on "Methods of Teaching," which was read before The Society for the Promotion of Engineering Education, an association which is an important element in advancing the interests of technical colleges. This it aims to do in a most effective and thoroughly meritorious way, by advancing the efficiency of the actual work of teaching done in these colleges. This year the seventh annual meeting was held at Columbus, Ohio, the meeting last year being in Boston. The Society was formally organized in Chicago in 1893, after a session of the Section on Engineering Education of the Engineering Congress of the Exposition. The papers presented at this meeting were so good, and the enthusiasm was so marked, that a permanent organization became a matter of course. Members of the Institute Faculty have been very active in the work of the Society.

The secretary *pro tem.* who acted throughout the Chicago meeting was a member of our Faculty. The Institute was represented on the committee of three which drafted the constitution. It has always had a place on the Council which governs the Society. For two years the important and laborious office of secretary was held by one of our professors. The valuable report on entrance requirements was the work of a special committee, of which Doctor Tyler was secretary and one of the two most active members. Three times the office of vice-president has been held by Institute representatives, and the president elected at the second meeting of the Society was Professor Swain, whose

admirable annual address was devoted to the "Profession of Engineering Teaching," as he properly formulated it, a paper which served to crystallize the practice of the Society in confining its papers to those dealing with education, and not with engineering solely. There has been no meeting of the Society at which the Institute has not been represented, and at every meeting one or more papers have been presented by its professors, fifteen papers in all having come from them. The membership in the Society includes representatives from thirty-eight States and Territories, the District of Columbia, Canada, and four European countries. Among the strongest impressions made upon some of those who attend the meetings are, first, the widespread demand for engineering education throughout the country, and, second, the excellent work done by very many of the engineering colleges in meeting this demand.

That the members from the Institute should become active and earnest in the work of this Society is not a matter for surprise. Our members being connected with an independent college, and unhampered by classical traditions, — an advantage readily admitted by teachers of engineering in some of the great universities, — and the Institute being also the largest college of engineering in the country, there is abundant opportunity for its influence to be felt for good in the promotion of engineering education, and this influence has been exerted in the same unselfish spirit which has characterized the work, especially, of the older members of the Faculty, to whose untiring zeal has been due in large part the success which the Institute has achieved.

GENERAL INSTITUTE NEWS

ENTRANCE EXAMINATIONS

The total registration of the entrance examinations, which were held this year on June 29th and 30th at the Institute and at other places, showed a notable increase over last year, and is larger than ever before, the registration for 1898 and 1899 being, respectively:

Complete . . .	217	217
Final . . .	113	153
Preliminary . . .	225	263
	555	633

It will be noted that the gain is wholly in the finals and preliminaries, corresponding to an increasing tendency to divide examinations between two successive years. The number actually admitted is twenty-five larger than in '98. A notable fact in connection with entrance examinations is the large number of applicants from the Mechanic Arts High School, there being this year 76 in all — a larger number than from any other school, public or private.

SCHOLARSHIPS

The duties of the Faculty committee on scholarships since the recent large increase in scholarship funds have become very important and require a large expenditure of time. At the July meeting the committee had before it 168 applications for Institute scholarships and made provisional awards amounting to more than fifteen thousand dollars. In nearly every case the committee's action was based on careful personal conferences with the applicant and independent testimony as to his needs. At its September meeting the committee dealt with a supplementary list and with 137 applications for the forty State scholarships. This year there was but one district sending no applicant. It is still necessary to restrict Institute scholarships to applicants already in the Institute whose

capacity can be judged on the basis of the work done with us; for State scholarships, however, this discrimination is not made.

Besides the amount applied to undergraduate scholarships, grants have been made from the Austin funds to Mr. Harry W. Gardner, '94, instructor in architecture, and Mr. George L. Hosmer, assistant in civil engineering. Mr. Gardner has been granted a year's leave of absence and has sailed for Italy, intending to divide his time between Italy, Sicily, and Greece, laying out his work with reference to the Institute course in elementary design. He is accompanied by Mr. Gorham P. Stevens, '98, who holds the Swett fellowship, and who will, after working in Italy, leave Mr. Gardner and go to Paris. Mr. Gardner's class at the Institute will be conducted by Mr. Theodore H. Skinner, '92. The award in Mr. Hosmer's case is on account of his excellent work at the new Geodetic Observatory under the direction of Professor Burton.

CORPORATION NOTES

The executive committee has held but one meeting during the summer. With regard to the disposition of the income of the Austin fund for the coming year it was voted to assign seven thousand dollars to undergraduate scholarships, this not being regarded, however, as a precedent for future years. In view of the treasurer's intended departure for Europe, Mr. Charles C. Jackson was authorized to act as treasurer. The following appointments were made: Mr. A. L. Davis, S. B., '97, assistant in mining engineering in place of Mr. Jacobs; Mr. Fred Louis Holt Kimball, S. B., '99, assistant in mining engineering; Mr. Etheredge Walker, S. B., '99, assistant in mining engineering, in place of Mr. Koch (who has accepted a professional appointment in Philadelphia); Mr. Miles Standish Sherrill, S. B., '99, assistant in analytical chemistry; Mr. Walter Humphreys, S. B., '97, assistant to the secretary, in place of Mr. Hopkins (who has become superintendent of one of the pauper institutions at Long Island); Mr. Henry E. Andrews, A. B., Harvard, assistant in English in place of Mr. Valentine; Professor Adolf Rambeau, of Johns Hopkins University, professor of modern languages and head of the department.

FACULTY NOTES

At the opening of the next term of the Massachusetts Institute of Technology, Dr. A. Rambeau will begin his work there as professor of modern languages. Professor Rambeau's family is French. He is of old Huguenot stock, but was born and brought up in Germany. He was educated at the Gymnasium of Wittenberg, studied classical, Romance, and Germanic philology at the Universities of Halle and Marburg, and French literature, phonetics, and dialectology at Paris. He received the degree of Doctor of Philosophy at Marburg in 1877, passed the "examen pro facultate docendi" in 1878, and lectured upon English grammar and literature at the University of Marburg in 1878 and 1879. He was afterward professor of English and French at the Wilhelm Gymnasium at Hamburg. During the past six years, from January, 1893, until his appointment at the Institute, he has been associate and associate professor of Romance languages at the Johns Hopkins University. The most prominent of his numerous publications are his doctor's dissertation on the assonances of the old French "Chanson de Roland," a book highly appreciated by workers in the same field; a treatise upon Chaucer's "House of Fame," an edition of Adam de la Hale's dramas (thirteenth century) and "La Chrestomathie Française," with phonetic transcriptions and an introduction upon the phonetic method, which he published with Jean Passy. He has contributed valuable papers to many periodicals, among them "Modern Language Notes," and is joint editor of *Neuere Sprachen*. He has also written forcibly and well on the teaching of languages with especial reference to the difficult subject of phonology. Doctor Rambeau combines in a high degree the qualities of a successful teacher and of a distinguished original scholar.

On Wednesday, September 27th, the exercises of the Massachusetts Institute of Technology were begun. Since the end of the last term some changes have been made in the Faculty. Adolph Rambeau, Ph. D., has been made professor of modern languages, and has charge of that department. Arthur A. Noyes, Ph. D.,

formerly associate professor of organic chemistry, has been made professor of theoretical and organic chemistry. Jerome Sondericker, C. E., formerly assistant professor of applied mechanics, has been made associate professor of applied mechanics; Allyne L. Merrill, S. B., formerly assistant professor of mechanism, has been made associate professor of mechanism; Edward F. Miller, S. B., who was assistant professor of steam engineering, has been made associate professor of steam engineering. Carleton A. Read, S. B., who was an instructor in mechanical engineering, has left to take charge of the mechanical engineering department in the New Hampshire College at Durham; George V. Wendell, Ph. D., has returned from three years' study in Germany, and resumes his duties as instructor in physics; Frederic H. Keyes, S. B., and Alexander W. Moseley, S. B., have left to take up professional work; Frederick A. Hannah, S. B., has accepted a position in the mechanical department of the Brooklyn Polytechnic Institute; Captain John Bordman, Jr., who was instructor in military science, is on his way to the Philippines with the 26th U. S. Infantry, of which he is the regimental adjutant; Myron L. Fuller, who was an assistant in geology, has been made an instructor in geology.

THE TECHNOLOGY CLUB.

While this has been the busiest summer in the history of the Technology Club, the usual number of repairs have been made. On the third floor a new bathroom has been built, which adds much to the comfort of those using the sleeping-rooms. In the reading-room the Class of '88 has hung a large German picture. The table of periodicals seems much more attractive because of the new covers made for the papers and magazines. The annual meeting of the club is on the second Monday of October, at which the officers will make their annual reports, and those for the coming year will be elected. A list of most interesting smoke talks is being made for the season.

NEWS FROM THE CLASSES

1869.

HOWARD A. CARSON, *Rep.*
20 Beacon Street, Boston.

H. A. Carson has returned from his trip to Egypt, and has given an illustrated talk on what he saw there; this was before the Boston Society of Civil Engineers at the September meeting.

1870.

PROF. CHARLES R. CROSS, *Sec.*
Mass. Inst. Technology, Boston.

Prof. C. R. Cross has been reëlected chairman of the Rumford Committee of the American Academy of Arts and Sciences.

1871.

EDWARD W. ROLLINS, *Sec.*
19 Milk Street, Boston.

E. W. Rollins is spending a good share of his time just now at Denver, which was for many years his residence and the headquarters where he developed a considerable part of his business. — Edward H. Foote's address is changed to 77 South Market Street, Boston.

1872.

PROF. C. FRANK ALLEN, *Sec.*
Mass. Inst. Technology, Boston.

The office of Walter Shepard, chief engineer of the Boston & Albany Railroad, is in the new South Station, Boston. — At the commencement exercises at Yale, last summer, the degree of LL.D. was conferred on Charles Sedgwick Minot, who is the first Institute graduate to be honored with this degree. Somewhat of special distinction attaches, in view of the fact that it is seldom conferred, as in this case, in appreciation of scholarship or scientific achievement, its function generally being to further honor those who have attained prominence in public or semi-public life. Minot was the youngest graduate in '72, and before he graduated had presented several papers before the Boston Society of Natural History. After graduation he studied for a year at Penekese and at Cambridge, with Professor Agassiz. Following this came three years of study at Leipsic, Paris, and Würzburg.

He has been for many years connected with the Harvard Medical School, his first appointment being that of lecturer on embryology. He became afterward, in turn, instructor in oral pathology and surgery, instructor in histology, assistant professor and finally professor of histology and human embryology. His studies have been directed especially to experimental physiology and comparative anatomy. His work at first was largely physiological, but has been concentrated in an increasing degree upon comparative embryology. His large 8vo volume, of more than eight hundred pages, on "Human Embryology" is standard throughout the world, and his "Bibliography of Vertebrate Embryology" is the most complete that has been compiled. He has devoted himself especially to research; among the most important work in that direction may be mentioned "The Physiology of Muscles," "The Laws of Growth" (the experiments lasting many years), "The Structure of the Placenta." A list of articles contributed by him is utterly impracticable here on account of its length. Dr. Minot has not been lacking enthusiasm in promoting scientific interests, as is evidenced by his having taken an active part in founding the American Society of Naturalists (of which he has been president), the Society for Psychical Research, and the Marine Biological Laboratory at Wood's Hole. He is now president of the Boston Society of Natural History, a member of the American Society of Physiologists, and of the American Society of Morphologists. He has the further distinction of being a member both of the American Academy of Arts and Sciences and of the National Academy of Sciences. After all, the successful results already accomplished by Doctor Minot in a life devoted to science (with many years of useful effort before him), constitute his greatest distinction, greater surely than the very honorable degree so worthily bestowed upon him, as a mark of recognition and appreciation of his labors.

1873.

SAMUEL E. TINKHAM, *Sec.*
City Hall, Boston.

Webster Wells has changed his publishers, D. C. Heath &

Co. having succeeded Leach, Shewell & Sanborn in the publication of this series among others. — In the *Railroad Gazette* we find the following: "Mr. Samuel M. Felton has been elected president of the Chicago & Alton Railroad, to succeed Mr. E. H. Harriman, who resigns to become chairman of the executive committee. Mr. Felton is so well known that it seems almost superfluous to give any sketch of his career. He was born in Philadelphia, February 3, 1853, being the son of Samuel M. Felton, the famous war president of the Philadelphia, Wilmington & Baltimore. Mr. Felton was graduated at the Massachusetts Institute of Technology, and at once entered railroad service. He passed through various grades, becoming chief engineer of the Chester & Delaware River Railroad, then general superintendent of the Pittsburg, Cincinnati & St. Louis, later general manager of the New York & New England, and of the New York, Pennsylvania & Ohio, and vice-president of the New York, Lake Erie & Western, in charge of traffic, and for five years he was first vice-president of the Erie, in charge of traffic and operation. Then he became president of the East Tennessee, Virginia & Georgia, and finally president and receiver of the Cincinnati, New Orleans & Texas Pacific. It will be seen that his experience, extending over many years, has been varied and important, and he is still a comparatively young man, and in the full vigor of mind and body." — William E. Brotherton is with Rogers, Brown & Co., Carew Building, Cincinnati. — Capt. Henry L. Ripley is stationed at Manila and is adjutant of the Third Cavalry, U. S. A.

1874.

CHARLES F. READ, *Sec.*
37 Cypress Street, Brookline.

William B. Dowse, of the Metropolitan Rubber Company, is at 35 Howard Street, New York City.

1875.

E. A. W. HAMMATT, *Sec.*
53 State Street, Boston.

Wilfred Lewis and Luther A. Roby have been in Boston recently. — Samuel E. Allen is selling agent for the Nashawannuck Manufacturing Co. —

Amos J. Boyden is architect and superintendent of construction of the new United States Mint at Philadelphia. — M. D. Burnet is general superintendent of the Eastern Coal and Coke Company, Cokedale, Kansas. — The address of E. A. W. Hammatt, civil and hydraulic engineer, has been changed to 53 State Street, Boston. — William H. Shockley is with the Pekin Syndicate, China. — J. B. Stanwood is secretary and engineer of The Houston, Stanwood Granite Co., and secretary of the Cincinnati Technical School. — H. L. J. Warren's address is Atlas Building, Salt Lake City, Utah; he is a mining journalist.

1876

JOHN R. FREEMAN, *Sec.*
Providence, R. I.

A. L. Mills, who has been a member of the firm of Paddock, Hodge & Co., grain merchants, is now vice-president of the Paddock Hodge Co. — Theodore E. Schwarz is manager of the Iron, Silver Mining Co., of Leadville, Colo. — We saw Martin Gay in New York last week. Martin rates as a '76 man, though the catalogue puts him down as '77. He now has the responsible position of assistant engineer of the bridge department of the city of New York. He has been connected with the public works of New York nearly all of the time for the past twenty years; first, in the water supply department, surveying for and supervising the construction of storage reservoirs in the Croton and Bronx districts, but has for some years past had charge of bridge construction. — Frederick Greeley is now East, locating his eldest son as a Harvard freshman. — Roy Hunt, son of the late Capt. A. E. Hunt, enters Yale this fall. It is interesting to note that two of our ablest and most successful Tech men, while both loyal to Tech, have thus shown preference that their sons should take the course at these older universities, because of a feeling that the closer companionship and college life there found is a great power for good. It was the hope of Captain Hunt, and is, we presume, that of Mr. Greeley, that their sons will later graduate at Tech. — The son of Charles A. Sawyer, '76, came directly to Tech., where he is now about to begin

his sophomore year. — Henry Raeder, '76, of Chicago, who graduated as a civil engineer and immediately found employment as chemist to a lead works, next became a railroad engineer, and later achieved much success as an architect, has, we learn, now taken some ventures in the theatrical line. We hear that in the capacity of an architect he constructed a theatre, and in the capacity of creditor had to take its management, and has met with much success. He continues in active work in his profession, as senior partner of the firm of Raeder & Coffin, architects, Chicago.

1877.

RICHARD A. HALE, *Sec.*
Lawrence, Mass.

The President of the Metropolitan Contracting Company, Henry H. Carter, a member of '77, has recently returned from abroad. — A. L. Plimpton, the chief engineer in charge of surface lines of the Boston Elevated Railroad is very busy in planning arrangements in connection with Elevated work. — Stephen Decatur, Jr., is now in Portsmouth living with his family. — The secretary is busy in connection with subscriptions toward the Walker Memorial Fund.

1878.

LINWOOD O. TOWNE, *Sec.*
Haverhill, Mass.

James Ritchie is chief engineer of the Department of Public Works for the city of Cleveland.

1879.

HARRY H. CAMPBELL, *Sec.*
Steelton, Penn.

On August 26th, Prof. Richard W. Lodge and Mary Latimer Paton were married. — Arthur M. Waitt is superintendent of motive power and rolling stock for the N. Y. C. & H. R. R. — Walter S. Allen is secretary of the Massachusetts commission for the Paris exposition. — H. H. Campbell is abroad for an extended trip in the interests of the Pennsylvania Steel Company, of which he is now general manager as well as superintendent.

1881.

MAJ. FRANK H. BRIGGS, *Rep.*
2 High St., Boston.

Charles H. Ayers sold out his shoe business at New Haven, Conn., about a year ago, and is now special agent of the New

York Life Insurance Company at Boston. — Edwin J. Lewis, Jr., has gone to Europe for a brief period. — Dr. John Duff, of Charlestown, is a member of the bath commission of the city of Boston. — Maj. Frank H. Briggs has raised, by subscription among the alumni of the Institute, about $240 to clear the deficit in athletics at the Institute. About $50 more is necessary to free the association from debt. — N. W. Shed is metallurgist at the Malleable Iron Works, Philadelphia. — John H. Allen spends a year abroad, mainly in London. He looks after the construction and erection of a large copper smelting plant in Spain.

1882.

WALTER B. SNOW, *Sec.*
Watertown, Mass.

Rufus F. Herrick and Miss Carrie Burley were married Thursday, June 22d. They will reside at 16 Herrick St., Winchester, Mass. — Edgar B. Thompson is now mechanical engineer of the Chicago & Northwestern Railway Co., with office at the Chicago shops of the company. The appointment went into effect August 11th. His home address is 220 Wisconsin Avenue, Oak Park, Ill. — Thomas B. Carson, of Davenport, Ia., has recently been East, and called upon the secretary, with his son, Clark Carson, the class boy. It seems that the latter is the particular chum of 81's class boy (son of F. G. Darlington) at Lawrenceville school, which both attend. — Howard K. Blair appears to have been the only man connected with the class of '82 who performed any military duty during the Spanish-American war. At its outbreak he took an active part in the recruiting for the State troops, and in June, 1898, went into camp at Chickamauga, as captain of Company L, 1st Vermont volunteers, the only regiment called from that State. Returning in the fall, the regiment went into camp north of Burlington, Vt., for about two weeks. The sudden change from a hot to a cold climate affected his lungs to such an extent that he came to Boston for medical treatment. A summer residence at Fitzwilliam, N. H., has much improved his health. His home is at West Derby, Vt. — "The Pearl of the

Antilles," by F. M. Noa, has been published by G. P. Putnam's Sons. It gives in brief form the circumstances which led to the Cuban rebellion, and the subsequent interference by the United States. — Charles J. A. Wardwell, who was a member of the class during its freshman year, is now located in Woonsocket, R. I. — Harry M. Neff has been exercising his inventive genius on improvements in roller bearings, for which he has applied for a patent. — Edward R. Adams is a member of the Pacific Club of Honolulu. — George Faunce is the president and general manager of the Pennsylvania Smelting Company, Carnegie, Penn. — John F. Low is now president of the Low Art Tile Company. — Henry F. Ross is treasurer of the Boston Thread and Twine Company.

1885.

ARTHUR D. LITTLE, *Sec.*
7 Exchange Place, Boston.

H. P. Talbot spent the summer abroad. Mrs. Talbot accompanied him.

1886.

PROF. ARTHUR G. ROBBINS, *Sec.*
Mass. Inst. Technology, Boston.

James C. Duff is technical editor and chief chemist of *The National Provisioner*. — Wilson H. Low is factory manager and chemist of the soap and glycerine departments of the Cudahy Packing Co. — D. P. Bartlett has returned from a trip to the Yellowstone. Professors Noyes and Goodwin and Mr. H. W. Smith were of the party. — A. A. Noyes, en route from the Yellowstone, attended the convention of the American Association for the Advancement of Science at Columbus, Ohio. He was elected secretary of the chemical section (Section C) of the association.

1887.

EDWARD G. THOMAS, *Sec.*
4 State St., Boston.

The following notice of Mr. Burgess's story in the July number of the *Century Magazine* appeared in a recent number of the *New York Saturday Review*: "It is a highly clever début Mr. Gelett Burgess has made in the July *Century*, in his short story, 'A Romance Invaded.' There is nicety in handling the subject, cleverness in the dénouement, and an exact sufficiency not of the ludicrous or farcical element,

but what is a high comedy effect. 'Collaboration is the thief of time,' so Griflet, the artist, tells Churchill, the publisher, but he does join his work with that of Miss Ola Prince. Mr. Gelett Burgess has been furnishing *The Criterion* with a whole series of illustrated articles which were delightful pleasantries. Can we not afford to be prophetic and so believe that Mr. Gelett Burgess will make his mark in literature? Mr. Louis Loeb's illustration to the story is excellent. You may depend on it that Miss Ola Prince always insisted that Griflet as an artist should follow precisely her text, and so the snug room where Miss Ola is writing and correcting her bothering proof looks exactly like a corner in the *Century* office." — Frank E. Shepard is president of the Denver Engineering Works. — F. H. Thorp has returned from a summer abroad.

1888.

WILLIAM G. SNOW, *Sec.*

4 Post Office Sq., Boston.

Herbert F. Pierce has formed a copartnership with Rowland H. Barnes, '91, for conducting a general civil engineering business, special attention being given to sewerage, drainage, and water-supply. Their office is 7 Water Street, Boston. — William G. Besler has severed his connection as division superintendent of the C. B. & Q. R. R. at Beardstown, Ill., to take a similar position with the Philadelphia and Reading R. R. at Reading, Pa. — George U. G. Holman has became associated as consulting engineer with Dewitt Smith, president of the Richmond, Petersburg, and Carolina R. R., with offices at 144 Broadway, New York. — A large picture, the gift of the class to the Technology Club, has been hung there in the Common Room. — Arthur S. Williams is treasurer of the Consolidated Machine Specialty Company.

1889.

JAMES W. CARTWRIGHT, JR., *Sec.*

Bangor, Maine.

F. L. Dame is general superintendent of the Tacoma Railway and Power Company.

1890.

GEORGE L. GILMORE, *Sec.*

Lexington, Mass.

Mr. Arthur H. Adams has left the telephone company in

Paris, and is now with the Sturtevant Engineering Co., 75 Queen Victoria Street, London. Before taking up his new duties he has been spending a few weeks in Boston. — Prof. H. W. Goodwin has been elected a member of the Council of the American Academy of Arts and Sciences. — George D. Chapman is superintendent of the Fitchburg Machine Works. — George W. Fuller has opened an office at 220 Broadway, New York City, where he is pursuing his professional practice as consulting expert on water purification and sewage disposal. — Samuel D. Flood is district manager of the American Cotton Company of New York. — Edward Robinson is professor of mechanical engineering at the Clarkson School of Technology, Potsdam, N. Y. — Schuyler Hazard, who has been with the Big Four for a number of years, has gone into business under the firm name of Lee & Hazard. Those who appreciate Hazard's enthusiasm for the things he enters into will not be surprised to learn that the Engineers Club at Cincinnati elected him their president.

1891.

HENRY A. FISKE, *Sec.*
70 Kilby Street, Boston.

Carleton A. Read has accepted a position in charge of the department of mechanical engineering at the New Hampshire College of Agriculture and the Mechanic Arts at Durham. — Morris Knowles, who has until recently been at Pittsburg as resident engineer of the Filtration Commission, is now employed in Philadelphia upon work for the improvement of the water-supply of that city.

1892.

PROF. SEVERANCE BURRAGE, *Sec.*
Purdue University, Lafayette, Indiana.

Mr. Albert Francis Sargent was married on the sixth of September to Miss Clara Lillian West, of Malden, Mass. — George V. Wendell has just returned from his three years of study in Germany. He resumes his former position as instructor of physics at the Institute. While in Germany, he spent two years at the University of Leipzig, and on the fourth of July, 1898, received the degree of Ph.D., *summa cum laude*. He was the last student of Geheimrath Wiedemann.

His third year was spent at the University of Berlin, where he studied under Professor Warburg and Professor Plunck. — Leonard Metcalf has changed his civil engineer's office to 14 Beacon Street. He is now constructing a sewerage system for Concord, Mass., and employs several Tech graduates. — L. B. Manley has safely returned from an extended trip to the Alaska gold fields. He kept in good health, didn't find much gold, and will not go again. He represented Boston capitalists there.

1893.

FREDERIC H. FAY, *Sec.*
60 City Hall, Boston.

Thomas Talbot, son of a former governor of Massachusetts, who was with the class in its freshman year, is seeing considerable military service. During the war last year he made the campaign in Porto Rico with the Sixth Mass. Volunteers as lieutenant in Company E, of Framingham. This year he has been commissioned captain in the famous Twenty-sixth U. S. Volunteers, whose commander, Colonel Rice, made an enviable record while commanding the Massachusetts Sixth. On the journey to San Francisco the Twenty-sixth spent two days in Boston, and, just as the regiment was leaving that city for Providence, an incident occurred which showed the courtesy of Captain Talbot. To quote from a Boston paper: "As Company K, Captain Talbot's command, approached, a woman jumped out of the crowd which the policemen were keeping back, and, going directly to the officer commanding, whispered something to him. The officer doffed his hat, halted his company and called out in a clear voice: 'Private ——, fall out!' The astonished soldier obeyed. The officer commanded 'Forward, double time!' for the other companies had advanced a short distance while the men were halted, and pointing to the grateful woman, who was trying to say a few words of thanks, marched on. He said not a word to the soldier, and did not tell him to hurry back, but after a few words with the almost crying woman he hastened to return to his place. As the company marched away the crowd applauded heartily,

perhaps because it was the last company of the regiment, and perhaps, more likely than not, because they wished to let the courteous officer know that they commended the act that made one, and probably two persons happy." — During the recent summer vacation, Charles M. Spofford, instructor in civil engineering at the Institute, has been with the Phœnix Bridge Co. at Phœnixville, Penn., where he was employed prior to entering the field of teaching. — F. F. Skinner, for some years past in the office of the city engineer of Boston, has recently entered the employ of J. R. Worcester, consulting engineer (in structural work), at 53 State Street, Boston. W. C. Lambert and H. R. Kimball, other '93 men, are also with Mr. Worcester. — During the Spanish war, Samuel N. Braman was connected with the department of steam engineering of the U. S. Navy, at the Charlestown Navy Yard, and was in charge of repairs and alterations on a number of government vessels. — William T. Barnes, who recently accepted a position as assistant engineer in the engineering corps of the Baltimore & Ohio Southwestern Ry., and Charles G. Waitt, of Malden, Mass., were, during 1898, elected associate members of the American Society of Civil Engineers. They are the first members of this class to attain corporate membership in that society. — Mr. Cecil E. Paine and Miss Janet Abigail Sargent were married June 21, 1899. They will reside at 723 Middle Street, Bath, Me., in which city Mr. Paine is employed as engineer of the Hyde Windlass Company. — The announcement of the engagement of Edward McKim Hagar, of Chicago, to Miss Martha Barry, of Dorchester, Mass., will be interesting news to a host of the former's classmates. Of course it was to be expected that no one but a loyal Tech girl would find favor in Hagar's eyes, and we are not surprised to learn that Miss Barry is a sister of Edmund Barry, '95. Hagar is senior member of the firm of Edward M. Hagar & Co., dealers in engines and mill machinery, and for some time has been secretary of the Northwestern Association of the M. I. T. The Institute has a no more loyal alumnus in Chicago

than Hagar, and the successful growth of the Northwestern Association in the last few years has been due in great measure to his energetic and faithful work. Ninety-three extends hearty congratulations upon the happy event.

1894.

WALTER E. PIPER, *Sec.*
Fells, Mass.

J. Calvin Locke is again under the board of health of the Department of Health of New York City, office at 38 and 40 Clinton Street, Brooklyn, New York. He took a civil service examination for the position and holds the title of sanitary inspector. — The following '94 men have consented to act as canvassers to aid in raising funds for the Walker Memorial Gymnasium: MacClure, Price, S. G. Reed, King, and Sherman. — Tom Richards has recently been made superintendent of the Boston Woven Hose and Rubber Company. — Not long since Lovejoy was appointed assistant manager of the Kodak Park Works of the Eastman Kodak Company, at Rochester, N. Y. — King is spending the summer at Chautauqua, N. Y. Besides his other degrees he has now an LL. B. to handle, from the New York Law School. — Price has left the Peoria Rubber and Manufacturing Company at Peoria, Ill. He is now in Chicago starting a new factory to manufacture rubber carriage tires. — Harry R. Batcheller and Miss Ethel F. Pierce, of Medford, Mass., were married in July. — Nelson Wrightington expects to go to Europe in September. — Frank Drake is chief engineer of the Oliver Mining Company, Ironwood, Michigan. — F. P. McKibben has spent the summer with the Boston Elevated Railway Co. on structural work. His last year's vacation was spent at New Bedford on the large bridge under construction there. — Franklin H. Robbins and Marie La Loge were married on September 5th.

1895.

EDWARD H. HUXLEY, *Sec.*
29 Hampshire Street, Cambridgeport, Mass.

F. C. Schmitz, who entered the employ of the Pennsylvania line west of Pittsburg, has made a change of base and is now assistant engineer of the Continuous Rail Joint Com-

pany, Newark, N. J. Schmitz investigated the subject of rail joints very thoroughly while with the railroad, experimentally and otherwise, and is good authority on that point. — The secretary will be glad to receive opinions from the members as to the advisability of undertaking a reunion and dinner this year; also the best time in which to hold a reunion. — Mr. A. L. Canfield was married, September 5th, to Miss Louise Haskins, of Rockport. A reception was held after the ceremony at the summer residence of Miss Haskins's father at Rockport. — A. D. Fuller is contemplating a trip abroad during the winter. He will also remain over to the Paris Exposition. — Special attention is called to the canvass which is going on for subscriptions to the Walker Memorial Gymnasium. Every member of the class is urged to contribute as liberally as possible. — P. H. Blodgett has gone to Pittsburg from McKeesport to accept a responsible position with the newly formed tube trust. Mr. Blodgett has been with the National Tube Works Company since graduation. — F. A. Hannah has accepted a position in Brooklyn, having charge of the mechanical department of a large technical school. — G. W. Hayden is in Boston again with the N. E. T. & T. Co. — S. S. Clark has given up his position in Lehigh University and come East to interest himself in the practice of Christian Science. — Azel Ames has a fine position with the N. Y. C. & H. R. R., with headquarters in New York. — F. W. Belknap was recently married. — H. W. Chamberlain, who has been in Italy since graduation, recently died there. — M. L. Fish, who has been ill for some time, is recovering. He is in Colvin Park, Ill. — J. L. Newell, who has been studying law, was admitted to the Massachusetts Bar this fall. — The secretary recently received a letter from R. G. B. Sheridan, from Russia, where he has gone to set up some machinery for the Brown Hoisting & Conveying Company.

1896.

F. E. Guptill, *Sec.*
71 Newbury Street, Boston.

Norman F. Rutherford, Course VI., with the De La Vergne Refrigeration Machine

Co. of New York, is now in Australia in the interests of that company. — J. Lloyd Wayne, who is with the New York Tel. Co., was in town recently. — Merryweather, Hunt, Dickinson, and several other '96 men have been seen in New York recently, on passing visits only. — Ben Hurd, formerly with Blood & Hale, Boston, has accepted a position with The Century Company of New York. — E. C. Hultman leaves his position with the Barbour Stockwell Co. to accept a better place as inspector for the West End Railway. — M. S. Jameson, who has been with the N. Y., N. H. & H. R. R. in Boston, has been promoted and transferred to work in Connecticut for the same company.

1897.

JOHN ARTHUR COLLINS, JR., *Sec.*

55 Jackson Street, Lawrence, Mass.

On April 6, 1899, a son, Edwin Lawrence Howard, was born to Mr. and Mrs. Ethan H. Howard, of Buffalo, N. Y. Thus far this is the first child in the class of which we have record, so Master Howard bids fair to fill the honored position of class baby. — Arthur T. Elson, formerly with the Norwich Bleaching and Dyeing Company of Connecticut, was connected with the Georgia Textile School, Atlanta, Ga. This department is quite new, having been instituted during the past winter. — William A. Kent was mustered out May 17, 1899, as second lieutenant, Third U. S. Vol. Engineers, and was appointed second lieutenant, U. S. A., June 1, 1899, and assigned to the Twenty-third U. S. Infantry. He sailed July 25th, from San Francisco, Cal., for Manila, to join his regiment now stationed on the Philippine Islands. Mr. Kent was married on July 8th to Miss L. L. Pierson, of Washington, D. C. — The third annual alumni dinner of the Class of '97 will be held early in December, probably at the Technology Club. It is far more desirable that the dinner be held there than at one of the hotels, since the Club is a part of Technology; and gathering there once a year as we do, we feel that the ties that bound us to our alma mater are not wholly severed. Full announcement will be made in the annual circular letter to be sent out in November. — Circulars, and blanks,

together with personal letters relative to the Walker Memorial Gymnasium, are being sent out to the men as fast as possible, and no one should feel slighted if he has not as yet received copies. They will surely come; and there is no better way in which a man can pay in part the debt that he owes to Tech than by contributing to this noble project. — The engagement is announced of Miss Edith L. Drury and E. Harold Woodworth. Mr. Woodworth is with the Aristo Chemical Company. — A. L. Parsons, formerly with the Metropolitan Water Commission at Clinton, Mass., is now engaged in work on the Government Printing Building at Washington. — Edgar H. Barker, of Lawrence, Mass., was married on June 18th to Miss Annie Graham Seddon, of the same city. Mr. Barker is a professor at the Lowell Textile School. Proctor L. Dougherty, recently with the Hawks Electric Company, of Boston, has been made electrical engineer in the office of the Supervising Architect in Washington. — J. B. Stouder is with the Nicaragua Canal Commission doing topographical work. — George Burnham has left Boston for New York, where he has become a member of the firm of Tryon & Brown, architects. — Argylle E. Robinson, a member of Course IV., is receiving congratulations on the birth of a daughter. — E. M. Hawkins is abroad in the interest of the Pennsylvania Steel Company. He accompanies H. H. Campbell, '79, the general manager of the company.

1898.

C.-E. A. Winslow, *Sec.*
Hotel Oxford, Boston.

L. D. Gardner had a fall in August and was on crutches for some time with water on the knee. — B. B. Priest has a position with the Elevated Railway Co., of Boston, and is in Pennsylvania testing iron to be used for rails. — Ira M. Chace, Jr., has come east from Texas, where he was employed, to take a position as rodman on the N. W. System of the Pennsylvania lines west of Pittsburg. His address is care of chief engineer, Pennsylvania Company, Pittsburg. — Course I. men are congratulating H. R. Thayer on his engagement, recently announced. — G. B. Pillsbury,

who left to go to West Point in his Sophomore year, stands number one in his class there. — R. Lacy is in South Carolina building a branch road, thirty miles long, for the Southern Railroad Co. He had a narrow escape recently from being thrown over a steep embankment on a runaway car. — R. W. Pratt and C.-E. A. Winslow are both in the engineer's office of the Massachusetts State Board of Health. Of the total of six engineers in the office, two others are Technology men, W. S. Johnson, '89, and C. G. Hyde, '96. — G. R. Anthony and I. B. Dodge are draughting with the Lombard Waterwheel Governor Co., 61 Hampshire Street, Roxbury. Anthony intends to get back to the business side in the near future. — L. H. Byam has joined Wadsworth and the other men who are in the engineering department of the New York Central. — A. W. Lombard is with the Massachusetts Road Commission. — J. F. Muhlig is draughting in the Edison laboratories. — F. E. Coombs was married early in the summer, and that smile is more ready and expansive than ever. He is at 3 Hamilton Place, Boston, and deals with building materials. — The engagement is announced of F. R. Minnig, to Miss Ogden, of Keyport, N. J. The marriage is to take place early in November. — The secretary's annual circular will be sent out to the class very soon. It is hoped that the replies will be prompt and general. — E. S. Wiard is at Wardner, Idaho, as assistant engineer of the Empire State Idaho Mining and Developing Co. — G. H. Booth is in the engineering department of the Newport News Ship Building and Dry Dock Co. — E. H. Schroeder is at 1608 South 10th Street, Omaha, Neb., with John Lateuser, architect. — W. G. Smith is superintendent of the new system of water-supply recently installed at Falmouth, Mass. — G. P. Stevens is continuing his studies abroad. — Miss M. J. Thomson is teaching science at the Prospect Hill School, Greenfield, Mass. — J. N. Goddard is chemist for La Gran Fundicion Nacional Mexicana, Monterey, Nuevo Leon, Mexico. — A. I. Frye is chief engineer of the Pacific Bridge Co., 263 Yamhill Street, Portland, Oregon. — G. R. Davison

is an assistant electrician with the Standard Thermometer and Electric Co., of Peabody, Mass. — H. F. Cobb is the manager of the Philadelphia branch of the Palatable Water Still Co. — Instead of the monthly reunions, which so many '98 men forgot last year, it is planned to have three or four informal meetings this year, of which those members of the class living within reach of Boston shall be specially notified by postal card. — E. T. Foulkes is with C. H. Blackall, architect, at 1 Somerset Street, Boston. — E. B. Richardson is draughting in the Phillips Building, 3 Hamilton Place, Boston. — P. F. Johnson is now at 120 Sycamore Street, Milwaukee, Wisconsin, still doing expert work for the Johnson Electric Service Co. — D. W. Edgerly is at College Point, Long Island, in the chemical department of the Clinton Paint Co. — T. M. Roberts and W. W. Stevens are both in the government service, Roberts as electrical engineer and mechanical draughtsman in the U. S. engineer's office at Portland, Maine, and Stevens as computer in the supervising architect's office, Treasury Department, Washington, D. C.; Stevens's address is 1445 Binney Street. — A. F. Howard is assistant superintendent of the Portsmouth Electric Roadway at Room 2, Congress Block, Portsmouth, N. H. — H. K. Conklin is draughting for Howells & Stokes, architects, New York. His address is 47 Cedar Street. — R. E. Wilder's present address is 324 Pine Street, Steelton, Pa., where he is in the employ of the Pennsylvania Steel Co., as a draughtsman. — F. B. Heathman has left Boston to go into the office of F. A. Brooks, architect, Dayton, O. His address is 17 E. Third Street. — W. M. Perley is in Florida in the J. H. Pratt Chemical Laboratories. — G. T. Cottle is with the New York Insulated Wire Co., at Wallingford, Conn. — A. F. Porter is a chemist in the smokeless powder department of the Laftin & Rand Powder Co., at Pompton Lakes, N. J. — C. W. PenDell returns to Technology this year for postgraduate work in Course II. — The following clipping has been received: "An interesting account of the development and present condition of street railways, the value of their

bonds, and their influence on steam railroads has been given by Roger W. Babson, who has opened an office in the Knowles Building for the sale of street railway bonds exclusively — the only office of its kind in the State. Mr. Babson has been in the same business in Wall Street, until recently, and has only just returned from a 5,000-mile trip through the West, during which he made a study of twenty-two different street railway systems. He is a graduate of the Massachusetts Institute of Technology, and has made a specialty of street railways for several years. His office here will be his headquarters for New England. Most of his business is done with banks, which, as a rule, buy in much larger amounts than individuals." — L. D. Gardner is at Columbia College for an M. A. degree. — Dr. J. N. Lambert has settled in practice in Lowell.

1899.

Lawrence Addicks has accepted a position in the copper mines at Santa Rita, New Mexico. — Nearly all of the graduates have obtained employment, and there have been many applications for which no men were available. Archibald, Bennett, and Waddell are with the Metropolitan Water Board; Jensen and Loud are employed on the Metropolitan Sewerage Works; Adams has taken a position in the Michigan Central R. R.; Henderson on the Chicago & Northwestern; Robertson is with the New York, New Haven & Hartford; Ferguson has gone West with the Burlington & Missouri River in Nebraska; Drew makes a bold venture in going to the City of Mexico with the Mexican Central Railway, while Parker stays near at home with the Boston & Albany. Pinkham is with the Maintenance of Way Department of the Pennsylvania R. R.; Starr, Woollett, and B. Herman are in structural work with the Edgemoor Co.; F. E. Hermanns is at Phœnixville, and Price and Sites are with the Pennsylvania Steel Co. C. W. Brown, after a summer at his home, Rye Beach, finds a good position with the Brown Hoisting and Conveying Co. at Cleveland. Whitaker is employed in Boston by E. S. Shaw, '74,

whose specialty is structural work. Burgess is in sanitary work with C. W. Leavitt, Jr., New York City. Clapp is understood to be employed by the city of Providence. C. A. Smith was with J. A. Emery, '93, on street railway work, until he had a collision while on his bicycle. He is now with the Metropolitan Water Board. Walther is with Leonard Metcalf, '92, on the sewerage of Concord, Mass. Foote is in the employ of the Crocker, Wheeler Electrical Co., in New Jersey. Hasbrouck goes into mining with the Old Dominion Co., and Stockton has received employment with a cotton mill in the Southern States. E. Johnson, Jr., has spent the summer abroad. H. L. Morse has secured a position under Thomas L. Edison.

1900.

Mr. N. J. Neall writes from Heidelberg, that although he was too late to matriculate at the Hochschule in Brunswick, he was granted all the privileges and opportunities of the regular students. Also, that he was permitted to join several excursions from the Hochschule, one of which was to visit the harbors and shipyards of Hamburg and Kiel. He speaks of tramping through the Weser Valley and visiting Hamden, and, on his way to Brunswick, of visiting Göttingen. Life at Heidelberg, he says, is now (August 22) at its height, and adds that his time is spent in reading, studying, and walking, the latter being made possible by an almost endless number of roads and parks on the hills about the place.

In order that alumni may send notes which may be of interest to the readers of THE REVIEW, the following list of class secretaries with present addresses is published. It is hoped that many bits of class news will be sent to these secretaries:

'68. Prof. Robert H. Richards, Mass. Inst. Tech., Boston.
'69. Mr. Howard A. Carson, 20 Beacon St., Boston (Representative).
'70. Prof. Chas. R. Cross, Mass. Inst. Tech., Boston.
'71. Mr. Edward W. Rollins, 19 Milk St., Boston.
'72. Prof. C. Frank Allen, Mass. Inst. Tech., Boston.

'73. Mr. Samuel E. Tinkham, City Hall, Boston.
'74. Mr. Charles F. Read, 47 Cypress St., Brookline, Mass.
'75. Mr. E. A. W. Hammatt, 53 State St., Boston.
'76. Mr. John R. Freeman, 4 Market Sq., Providence, R. I.
'77. Mr. Richard A. Hale, Lawrence, Mass.
'78. Mr. Linwood O. Towne, Haverhill, Mass.
'79. Mr. Harry H. Campbell, Steelton, Penn.
'79. Mr. Walter S. Allen, Sec. Mass. Com. Paris Exposition, State House, Boston (Representative).
'80. Prof. Geo. H. Barton, Mass. Inst. Tech., Boston (Representative).
'81. Mr. Frank E. Came, 17 Place d'Armes Hill, Montreal, P. Q.
'81. Maj. Frank H. Briggs, 2 High St., Boston (Representative).
'82. Mr. Walter B. Snow, Watertown, Mass.
'83. Mr. Harvey S. Chase, 8 Congress St., Boston.
'84. Dr. Augustus H. Gill, Mass. Inst. Tech., Boston.
'85. Mr. Arthur D. Little, 7 Exchange Pl., Boston.
'86. Prof. Arthur G. Robbins, Mass. Inst. Tech., Boston.
'87. Mr. Edward G. Thomas, 89 State St., Boston.
'88. Mr. William G. Snow, Watertown, Mass.
'89. Mr. James W. Cartwright, Jr., Supt. Lighting Dept., Bangor, Me.
'89. Mr. Frank L. Pierce, 31 Milk St., Boston (Representative).
'90. Mr. George L. Gilmore, Lexington, Mass.
'91. Mr. Henry A. Fiske, 70 Kilby St., Boston.
'92. Prof. Severance Burrage, Purdue Univ., Lafayette, Ind.
'92. Mr. Leonard Metcalf, 14 Beacon St., Boston, Mass. (Representative).
'93. Mr. Frederic H. Fay, 60 City Hall, Boston.
'94. Mr. W. E. Piper, Fells, Mass.
'95. Mr. E. H. Huxley, 540 Atlantic Ave., Boston.
'96. Mr. F. E. Guptill, 71 Newbury St., Boston.
'96. Mr. Chas. G. Hyde, 70 Montgomery St., Boston (Representative).
'97. Mr. John A. Collins, 55 Jackson St., Lawrence, Mass.
'98. Mr. Chas.-E. A. Winslow, Hotel Oxford, Boston.

NECROLOGY

SUMNER HOLLINGSWORTH, '76

Of the three score years and ten of man's allotted term of life, the first score brings maturity of body; the second, that of mind; and from the years that follow should arise the noblest product of the life. For Sumner Hollingsworth these later years were not to be, and sorrow at the loss of a true friend is deepened by our keen perception of their promise, by the high character and large achievement of so short a life.

Sumner Hollingsworth was born on March 1, 1854, in South Braintree, Mass., where he lived until his marriage, and where his mother still resides. His unlooked-for death occurred at his summer home in Milton, Mass., on Monday, June 26, 1899.

His father, Ellis Anderson Hollingsworth, was the son of Mark and Waitstill Hollingsworth, who came to Milton, Mass., from Pennsylvania, where they had been living on lands deeded by William Penn, on the site of the battle of Brandywine. On the maternal side, also, he was descended from a distinguished family, his mother, Susan J. Sumner, being a cousin of Charles Sumner. These notable and Puritan strains showed in Sumner Hollingsworth in breadth of intellect, in clear and fearless insight, in conscientiousness and integrity, in a broad tolerance, which, though not of the Puritan spirit, is a development from it, — showed, too, in the refined intelligence of his countenance.

With his younger brother, Ellis Hollingsworth, who survives him, his early life was spent at the Braintree home. From the schools of Braintree he passed to the old Chauncy Hall School, of Boston, and from thence, in 1872, he entered the Massachusetts Institute of Technology. Here his marked capacity promptly found its natural high level. He was keenly receptive and analytical, assimilating at a single hearing or reading even difficult subjects. He seemed to think in terms of facts and phenomena, rather than in phrases and formulæ, although a mathematical expression possessed no mystic terror for him. The breadth of

mind and view that marked his later years was early in evidence in the attention that he gave to certain non-professional subjects quite unappreciated by far too many of his fellows. Often in after years would he, in face of adverse criticism, commend with quiet warmth the work of those who had taught these subjects. Friends of his student days will well remember, too, his composed deliberation in arriving at a conclusion, the soundness of his judgment, and his firm but rational confidence in his convictions. They will recall his unusually penetrative insight into scientific and technical matters, his marked ability to extract the kernel of fact from its useless husks of words and formulæ. They will remember in him unremitting, though unobtrusive, eagerness for the genuine in knowledge, and entire absence of all spirit of rivalry or envy. And not less well will they remember the unassuming, high-souled, wholesome comrade, as ready as the best for sport, but ever sane and manly in it. To this moral soundness none can better testify than two classmates who, in 1874, shared with him the unrestricted freedom of a three weeks' tramp among the mountains of New Hampshire. This outing, whose most ambitious day led us along the peaks from Madison to Washington, remains the fresher in the memory from a result to which it gave the initiative. The construction of a map of the White Mountains, from observations taken on the trip by one of the party, served as the nucleus of an active interest from which arose the formation of the Appalachian Mountain Club, in whose organization Hollingsworth participated.

Graduating from the Institute in the Department of Mechanical Engineering in the class of 1876, he entered on the business of paper manufacture, in which his father was engaged. His grandfather, Mark Hollingsworth, had purchased the mill of the Revere Copper Works at South Braintree. In 1851, his father, Ellis A. Hollingsworth, returning from California, whither he had gone in 1849, took this mill, converting it into a paper mill. Here, in 1853, were invented Manilla paper, and the manufacture of paper bags by machinery. This business was afterward developed under the firm name of Hollingsworth and Whitney (1862), and was organized in 1881–82 into the Hollingsworth and Whitney Company.

Of this company, Sumner Hollingsworth became the president in 1882, after his father's death.

The varied problems of this business afforded scope for his engineering ability and training, as well as incentive to earnestness. And so fully did he develop his unusual mental powers, despite conditions of ease so often paralyzing to the energy of young men, that before the close of his life he was well recognized as ranking easily among the foremost hydraulic and steam engineers of the country. Especially was he master, with few if any equals, of the many-sided problem of the efficient paper mill. This question he grasped in the broad and thoroughly scientific manner characteristic of the man. Duly subordinating every detail to the whole, dealing from intimate knowledge with its every phase, — power, buildings, machinery, processes, capital, labor, product, buying, selling, and management, — carrying out special investigations from time to time as contributive to the main purpose of his work, he solved the problem as a whole with that true sense of proportion, as rare as it is vital. How well he solved it, can testify the successful mills of his company, among the most extensive of their kind, which embodied, if not always to the full, his ever progressive ideas. Plans for another large mill remain unfinished.

Of the mental vigor and activity which accomplished so much, many an acquaintance was so unaware as to deem his life one of mere gratification of personal ease, an error rendered easy by a manner quiet and undemonstrative in public, and by the reticence of a sensitive nature.

Of his business relationships, let an extract from the resolutions passed by the board of directors of his company speak : —

" Since the formation of this board, in 1882, he has been its president, and during all that time his interest in all that concerned the growth and development of this business was warm and active, and by his death the company has lost a safe, capable, and conservative adviser.

" His individuality has impressed itself upon all his friends. His patient and just mind would deliberately arrive at its own conclusions, which were then pressed on others. When he thought he

was right, he was sure he was right, and he had the courage of his convictions. A true friend, he was ready to compromise honest differences and concede all that fairness required for the purpose of avoiding strife. He was of a kind and healthful disposition, and joined to his other qualities was a cautious and reflecting temperament. He was an honest man, and he coveted no man's goods. Esteemed by all who knew him for his ability and fidelity, and also for the kindly courtesy which he extended to each member of this board, a conservative counsellor, he won for himself, by the sincerity of his friendship, the respect of all. The members of this board will miss his quiet smile, and all feel that we have lost a friend."

Hollingsworth was a member of the American Society of Mechanical Engineers, of the Boston Society of Civil Engineers, and of the Society of Arts of the Institute; also of the Technology and Union Clubs, and of the Club of Odd Volumes. Especially fond of his home, he was in no sense a club man, but his connection with the Odd Volume Club, of which he was an active member, marks a most notable phase in a life of varied attainment, a phase of which many of even his most intimate friends were almost unaware. An insight into this is given by a fellow member of the club: —

" Led by an inherent taste, he turned to books for relaxation from the cares of business. Soon fixing his attention on the early colonial literature of our country, he collected the finest and most valuable private library of that description in New England, the John Carter Brown library, of Providence, excepted. In a few years more his library, which had already begun to attract the attention of historians, would, by the additions which he would have made to it, have been known and examined by any student of history who wanted to consult the original authorities, for he possessed many books which, so far as is known, are unique. He was a charter member and an officer of the Club of Odd Volumes. This club, although small in numbers, was especially attractive to him, for its objects were in harmony with his tastes. His example in collecting books, and his familiarity with their contents, con-

tributed largely to the success of the club. The exhibition of books held by the club on its tenth anniversary, which attracted the attention of literary Boston, was only made possible by large drafts on his collection. Only a very small portion of his library was exhibited, but from this portion an idea could be had of the great value of the whole."

In 1887 occurred his marriage with Miss Mary Clapp Stevens, of Gardiner, Maine, to whose wifely devotion and companionship no tribute can be paid more eloquent than that which speaks in his absorbed devotion to his home. The winter months found them in Boston, at their house on Fairfield Street, and, as a summer home, they took great delight in the old Sumner mansion at Brush Hill, Milton, for more than two centuries and a half the home of the Sumner family.

I love to think of my friend as an exemplar of a type of man in whom, and through whose influence, the best in the civilized life of this century is being transmitted to the next. Widely acquainted with the progress of science, and appreciative of its spirit; actively connected with industrial operations giving play to his engineering ability and training; with a refined taste for literature and the humanities, and with the means to gratify the taste; sensitive and retiring, but of sound judgment and entire courage; a staunch friend and a genial companion; a sterling and high-minded gentleman; faithful and devoted as son and brother, — he was a man of whom it could be said by her who knew him best: "It was in his home life that all that was sweetest and best in his rare nature shone the brightest. Perfect uprightness, an unfailing courtesy, a sweet and loving nature, with true manliness, rounded out a character which it was a blessing to have known."

Well may we cherish memories of such a life, as high incentive to the noblest manhood.

Silas W. Holman.

SAMUEL JOHNSON

Samuel Johnson, of the firm of C. F. Hovey & Co., a member of the corporation of the Massachusetts Institute of Technology, died suddenly at his summer home at Nahant, Mass., Sunday, August 13th, at the age of seventy-three.

Mr. Johnson was born in Boston, March 20, 1826, and resided there during his long life. He received his education at the Chauncy Hall School, and at the age of sixteen entered the store of Messrs. Hovey, Williams & Co., then importers and wholesale dealers in dry goods in Water Street. Since 1848 the firm has been known as that of C. F. Hovey & Co. In 1850 Mr. Johnson was admitted as a partner with Messrs. Henry Wood and William Endicott, Jr., a connection which has continued with unbroken harmony for nearly half a century. Although always interested in the details of his own business, for the last twenty years his time and attention have been principally given to engagements of a judiciary and semi-public character. He has been one of the trustees of several of the largest estates of the city, and has administered these important functions with conscientious fidelity. With these he assumed the charge of numerous and unpaid smaller trusts, and by his excellent judgment and absolute integrity has lifted the burden from many who were unable to care for themselves.

Among the public duties that have been confided to him there may be named: For many years he was chairman of the standing committee of the Old South Church and Society, and subsequently for twelve years its treasurer. So important and devoted has been his service to this church and society that its members, with one accord, will surely say that to no one among their number is the society more indebted than to Mr. Johnson for its present prominent and creditable position among the churches of Boston. He has long been one of the trustees of the Massachusetts Hospital Life Insurance Company, of the Provident Institution for Savings, the Boston Young Men's Christian Association, the Mount Auburn Cemetery, and the Wheaton Seminary, one of the directors of the Webster National Bank, and a member of the corporation of

the Massachusetts Institute of Technology. He has also filled the offices of president of the Massachusetts Congregational Charitable Society, the Congregational Society, the Boston Dispensary, and vice-president of the Home for Aged Women. To all these various duties he was faithful and true, devoting the energies of a warm heart and a well-balanced mind to affairs always important and often complicated, with the same attention that he would have given to his private interests.

He was married in 1858 to Miss Mary Stoddard, daughter of Deacon Charles Stoddard. Mrs. Johnson died in 1891, leaving two sons, who now survive their father.

The most conspicuous traits of Mr. Johnson's character were his serene and sunny temperament and his religious faith. With him everything was for the best, and when clouds obscured his sky he was always confident that the sun would soon shine again. Many there are who could testify to the thoughtful act or sympathetic word which Mr. Johnson never failed to give to those who came to him. His was a heart ready to sympathize with rich and poor alike, and his the ready hand to give generously if material aid were needed. His lifelong associates, as they look for an example of justice, integrity, generosity, and devotion to duty, will always recall with affection and respect the name of Samuel Johnson. — *W. E. in Boston Transcript.*

PROFESSOR JULES LUQUIENS

M. Jules Luquiens, who was a member of the instructing staff of the Institute for eighteen years, died on August 26.

He became instructor in modern languages under Professor Otis, 1874. After leaving the Institute he became head of the modern language department at Yale, where he took his degree of Ph. D., before he came to Technology, in the department of Oriental languages under Professor Whitney. He made a specialty of Persian, in which he excelled. If circumstances had permitted, he would have chosen this branch, but professional chairs of Persian were rare.

President Walker writes in his report for 1892:

"M. Jules Luquiens came to the Institute in 1874 as an instructor in modern languages; in 1880 he was promoted to be assistant professor, in 1884 to be associate professor, while in 1892 he was advanced to a full professorship, which he has resigned to accept the professorship of the Romance languages in Yale University. Professor Luquiens's superb scholarship will find a far wider field at New Haven than could be afforded it in the elementary instruction to which he was necessarily confined here; but he cannot be more highly esteemed and appreciated there than he was by the faculty and students of the Institute of Technology. Eminently and in every sense a scholar, he was also a most successful teacher. If I were to select one quality out of many which made him so useful and honored in his service with us, it would be his conscientiousness in the discharge of every duty. It was impossible for him to slight any part of the work which devolved upon him, however tedious, however seemingly insignificant. Professor Luquiens has carried with him to his new field of labor the gratitude and affection of all his former associates and of a host of 'Institute men.'"

REVIEWS

THE TECHNOLOGY QUARTERLY AND PROCEEDINGS OF THE SOCIETY OF ARTS

Edited by Robert P. Bigelow, Ph. D.

The September number of the *Technology Quarterly* contains the following articles:

Proceedings of the Society of Arts; The Manufacture and Use of Brewing Sugars in America, by G. W. Rolfe and George Defren; Apparatus for Testing Injectors, by C. F. Park; Contribution from the Laboratory of Sanitary Chemistry — I. on Nitrates as a Product of Combustion, by E. W. Axson; Results of Tests Made in the Engineering Laboratories; XI. Review of American Chemical Research.

REMINISCENCES OF THE SANTIAGO CAMPAIGN

By John Bigelow, Jr., Captain 10th U. S. Cavalry. Pp. vii., 188. New York, Harper & Brothers, 1899.

The many warm friends whom Captain Bigelow made during his four years of service at the Massachusetts Institute of Technology will read with a lively interest his frank and vivid account of the preparations for war and of the Santiago campaign, so far as these fell under his personal observation. There is a perfectly free discussion of the weaknesses and abuses that were constantly revealing themselves, but at the same time Captain Bigelow considers it no part of his duty to fix the blame upon any particular individuals. And herein is one of the chief merits of the book, which is essentially a journal of the author's experiences in camp in the South, on transport to Cuba, the battle of San Juan, his four wounds, return to the United States, and convalescence. The whole account is written in a picturesque and fascinating manner, with many bright flashes of humor. The concluding chapter makes some valuable suggestions for the improvement of the military system of the country. The general effect which the book produces on the reader is best summed up in a sentence from the preface, that "the surprising results of the war" were "due more, perhaps, to the unsuspected weakness of the enemy than to the strategic skill of our commanders." C. F. A. C.

THE RACES OF EUROPE

By William Z. Ripley, S. B. (M. I. T., 1890), Ph. D., Assistant Professor of Sociology, Massachusetts Institute of Technology. Vol. I., pp. xxxii., 624; 86 maps and diagrams, 222 portraits. Vol. II., Bibliography of the Anthropology and Ethnology of Europe, published by the Public Library of the City of Boston, pp. x., 160. New York, D. Appleton & Co., 1899.

"Some books," says Lord Bacon, "are to be tasted, others to be swallowed, and some few to be chewed and digested. That is, some books are to be read only in parts; others to be read, but not curiously [*i. e.*, with great care]; and some few to be read wholly,

and with diligence and attention." The work under consideration belongs to the class of the "some few."

It is to be noted at the outset that Doctor Ripley is dealing with races only, with purely physical relationships; although naturally many other matters are from time to time introduced, as having a bearing upon or being influenced by racial phenomena, still race is the dominant note throughout. In the popular mind race, language, and nationality are often confused, often regarded as interchangeable terms, but nothing could be further from the truth. Physical characteristics must be studied in order to settle ethnic difficulties, and one of the best tests is the shape of the head, particularly its relative length and breadth, known as the cephalic index, which is "simply the breadth of the head above the ears expressed in percentage of its length from forehead to back." Heads with a cephalic index above 80 are termed brachycephalic, below 75 dolichocephalic, and between 75 and 80 mesocephalic. We are warned that the index has to do with race only, and not at all with intellect, which has no more necessary connection with the cephalic index than it has with the absolute size of the head. One of the chief reasons why so great reliance is placed upon this cephalic index is because it is apparently not influenced by environment as are other physical features, such as the color of skin and hair, and the stature; these may all be radically modified by habitat or economic conditions, though the race remains unchanged. At the same time, pigmentation and stature are factors not to be absolutely neglected, since they may often throw new or additional light on racial problems. On the other hand, their testimony is often to be received with caution.

The author has chosen Western Europe for his principal field of study, partly because in this relatively small portion of the world all extremes of head form are to be found,—as well, it might be added, as all varieties of blondness, brunetteness, and stature,—and partly because it is here that cranial measurements have been made in sufficient numbers to be of scientific value. It is found that Europeans resolve themselves into three leading racial types, the Teutonic, Alpine, and Mediterranean; these three types, speak-

ing broadly, predominate, the first in the northern section, the last in the southern, while the second is found largely among the higher altitudes and in other of the less accessible localities. In the main, the Teutonic race is characterized by long head and face, very light hair, blue eyes, narrow, aquiline nose, and tall stature; the Alpine, by round head, broad face, light chestnut hair, hazel-gray eyes, somewhat variable nose, and medium, stocky stature; the Mediterranean, by long head and face, dark brown or black hair, dark eyes, rather broad nose, and medium, slender stature. It is probable that the Teutonic and Mediterranean races sprang from a common origin, and that such differences as they exhibit are due to the " influences of environment and of artificial selection."

Though Western Europe is the principal field of investigation, nevertheless all of the European countries are taken up and studied in detail, as is also Western Asia. This part of the book is so technical that it is difficult to select features which adapt themselves to a summary. It may be sufficient to say that, alongside of the thoroughly scholarly and scientific treatment of ethnic origins, is much that is intensely interesting, and not a little to upset preconceived notions, or at least give rise to doubts. To take a single illustration: the Jewish question has been prominent for many years and is bound to occupy a foremost place for a long time to come. In spite of the marked Jewish characteristics of stature, hair, eyes, nose, and skin, Doctor Ripley argues that the head form, as shown by the cephalic index, is of itself sufficient to prove that the Jews, contrary to popular belief, have not maintained a racial purity, but have in past centuries been largely intermixed with Gentiles, and there is, therefore, no " Jewish cephalic type." According to this view, " the Jews are not a race, but only a people," — a statement to which the Jews themselves will probably take exception.

The last part of the book is occupied with the discussion of certain allied problems, whose solution may be aided by the investigation of the racial composition of the European population, topics which cannot fail to be of interest to the general reader as well as to the specialist in anthropology and ethnology, and of no

less interest to us in America who are of European stock. And just at present it is perhaps the last chapter of the book that will prove the most instructive, that on acclimatization, the geographical future of European races.

With the growing density of population in the temperate climes, the question arises whether Europeans can live, not merely for a single generation, but for successive generations, in tropical regions; and if they can do this, whether they will retain their European civilization, or, provided they can live but not work there, must some form of slavery exist, European capitalists employing servile labor? After discussing the effects of a change of residence and of food, the effects of heat and humidity, of certain diseases, and of hygiene and sanitation, Doctor Ripley concludes, with the vast majority of writers, that "true colonization in the tropics by the white race is impossible," and that "a colonial policy in the tropics means a permanent servile native population."

However, there seem to be two possible recourses. One is to allow those Northern races which are best fitted for tropical life to move gradually southward as the pressure of population becomes more intense; but this presupposes altogether too altruistic notions to conform with the present-day political practices of nations in their colonial enterprises. The second is to imitate the method of introducing plants and animals into regions of quite unaccustomed climatic conditions, — "a large body of men is transplanted to the new habitat at once, the larger the number the better, from which by elimination a few fortunate variations survive. Thus, after a long time, and enormous sacrifice of life, a new type, immune to some degree, becomes established. All that the state need do is to keep up the supply of immigrants long enough, and leave the climate to do the rest."

Attention deserves to be called to the abundance and excellence of the maps, diagrams, and portraits, and to the bibliography of nearly two thousand titles.

CHARLES F. A. CURRIER.

ANNOUNCEMENTS

UNITED STATES CIVIL SERVICE EXAMINATIONS

From time to time notices of Civil Service Examinations are received at the secretary's office of the Institute. For the benefit of the alumni the following list is published. Persons desiring to compete should at once apply to the United States Civil Service Commission, Washington, D. C., for application blanks (Forms 304 and 375), which should be properly executed, and promptly filed with the Commission at Washington, D. C. These blanks may also be obtained from Mr. Edward E. Stebbins, Room 141, Post Office Building, Boston, Mass.

ASSISTANT PHYSICIAN, JUNIOR GRADE, Government Hospital for the Insane, October 4, 1899.

The United States Civil Service Commission announces that on October 4, 1899, examination will be held at any city in the United States where the Commission has a board of examiners, for the position of Assistant Physician, Junior Grade. The examination will consist of the subjects mentioned below, which will be weighted as follows:

	SUBJECTS	WEIGHTS
(1)	Letter-writing	5
(2)	Anatomy and physiology	15
(3)	Chemistry, materia medica, and therapeutics	15
(4)	General and special pathology	25
(5)	Surgery	20
(6)	Bacteriology and Hygiene	10
(7)	Obstetrics and gynecology	10
	Total	100

The minimum age limitation for entrance to this examination is twenty years; no maximum. The examination is open to both males and females, but a separate eligible register will be kept for each sex. From the eligibles resulting from this examination,

certification will be made to fill two positions in the Government Hospital for the Insane, one from the male register at $900 per annum, and one from the female register at $600 per annum.

HEATING AND VENTILATING DRAFTSMAN, Supervising Architect's Office, Treasury Department, October 17, 18, 19, 1899.

The United States Civil Service Commission announces that on October 17, 18, 19, 1899, examination may be taken at any place in the United States where the Commission has a board of examiners, for the position of Heating and Ventilating Draftsman, Supervising Architect's Office (Treasury Department). The examination will consist of the subjects mentioned below, which will be weighted as indicated:

	SUBJECTS	WEIGHTS
(1)	Arithmetic and elementary mathematics	10
(2)	Practical questions in heating and ventilating	40
(3)	Drawing and design	40
(4)	Technical education and experience	10
	Total	100

The age limitations for entrance to this examination are as follows: Minimum, twenty years; maximum, no limit. Competitors will be supplied with writing and drawing papers for the examination, but they must bring with them pens, inks, drawing-board, and all other materials likely to be used in the examination. From the eligibles resulting from this examination, certification will be made to fill the position of heating and ventilating draftsman in the office of the Supervising Architect, Treasury Department.

SHIP DRAFTSMAN, and Assistant Ship Draftsman Examinations, Bureau of Construction and Repair (Navy Department Service), October 17, 18, 19, 20, 1899.

The United States Civil Service Commission invites attention to its schedule examination which will be held this fall at various places throughout the United States for the positions of draftsman and assistant draftsman in the Navy Yard Service, Bureau of Con-

struction and Repair. The scope of and the time allowed for these examinations, together with other information, will be found in Section 57 of the "Manual of Examinations Revised to July 1, 1899." From the eligibles resulting from these examinations, certifications will be made to fill the positions of ship draftsman, Newport News, Va.; ship draftsman, Portsmouth, N. H.; assistant ship draftsman, Boston, Mass., in the Bureau of Construction and Repair (Navy Yard Service), and at salaries of $5, $6, and $4 per diem, respectively. These examinations are open to all citizens of the United States who comply with the requirements; all such citizens are invited to apply. They will be examined, graded, and certified with entire impartiality, and wholly without regard to any consideration save their ability as shown by the grade attained by them in the examination.

INSPECTOR OF STANDARDS, United States Coast and Geodetic Survey (Office of Standard Weights and Measures, October 28, 1899.

The United States Civil Service Commission announces that it is desired to establish an eligible register, from which certification may be made to fill the position of inspector of standards, U. S. Coast and Geodetic Survey (Office of Standard Weights and Measures), Treasury Department. Applicants will not be required to appear at any place for examination. The examination will consist of the subjects mentioned below, which will be weighted as indicated:

	SUBJECTS	WEIGHTS
(1)	Training and experience, comprising, especially, original investigations in physics . . .	30
(2)	Published papers having special reference to investigations in physics, or pertaining to standards of weight and measure . . .	30
(3)	Thesis of not less than two thousand words, nor more than four thousand words, on the proper functions of a national office of weights and measures	40
	Total	100

From the eligibles resulting from this examination, certification will be made to fill the position of inspector of standards, U. S. Coast and Geodetic Survey (Office of Standard Weights and Measures), Treasury Department, at a salary of $3,000 per annum.

CIVIL AND ELECTRICAL ENGINEER, Engineer Department at Large, October 17, 1899.

The United States Civil Service Commission invites attention to the examination which will be held on October 17, 1899, at all places marked "D" in the schedule, Section 9 of the Manual of Examinations revised to July 1, 1899, for the position of civil and electrical engineer, in the engineer department at large. The subjects and weights of this examination will be found in section 154 of the Manual, and are as follows:

	SUBJECTS	WEIGHTS
(1)	Mathematics	10
(2)	Drawing	10
(3)	Use and care of field and office instruments	5
(4)	Practical questions in civil engineering	10
(5)	Theoretical and practical questions in electrical engineering	40
(6)	Education and experience in civil engineering and in electrical engineering	25
	Total	100

The first two subjects will be given on the first day (7 hours), the third and fourth subjects on the second day (7 hours), the fifth subject on the third day (5 hours). From the eligibles resulting from this examination certification will be made to fill the position of civil and electrical engineer in the engineer department at large, Newport, R. I., at a salary of $125 per month. This examination is open to all citizens of the United States who comply with the requirements. All such citizens are invited to apply. They will be examined, graded, and certified without regard to any consideration save their ability as shown by the grade attained by them in the examination. Persons desiring to

compete should at once apply to Mr. Edward E. Stebbins, Post-office, Boston, Mass., or to the United States Civil Service Commission, Washington, D. C., for a Manual and application blanks (Forms 304 and 375), which should be properly executed and forwarded to the Commission at Washington, D. C., at least ten days prior to the date of the examination, September 23, 1899.

INTERPRETER, Immigration Service, Treasury Department, November 7, 1899.

The United States Civil Service Commission announces that on November 7, 1899, examination may be taken at any city in the United States where the Commission has a board of examiners for the position of interpreter in the Immigration Service, Treasury Department. The examination will consist of the subjects mentioned below, which will be weighted as follows:

	SUBJECTS	WEIGHTS
(1)	Spelling, second grade	4
(2)	Arithmetic, second grade	4
(3)	Letter writing, second grade	4
(4)	Penmanship	4
(5)	Copying from plain copy, second grade	4
(6)	Languages	40
(7)	Training and experience (to be rated on personal statements and vouchers)	40
	Total	100

From the eligibles resulting from this examination certification will be made to fill the position of interpreter of the Scandinavian and German languages at a salary of $1,000 per annum, and the position of interpreter of the Greek and Turkish languages at a salary of $1,200 per annum, in the Immigration Service at New York. This examination is open to all citizens of the United States who comply with the requirements. All such citizens are invited to apply. They will be examined, graded, and certified with entire impartiality, and wholly without any consideration whatever save their ability as shown by the grade attained by them

in the examination. Persons desiring to compete should at once apply to Mr. Edward E. Stebbins, Room 141, Post Office, Boston, Mass., or to the United States Civil Service Commission, Washingto, D. C., for application (Form 304 and special forms), which should be properly executed and filed with the Commission.

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